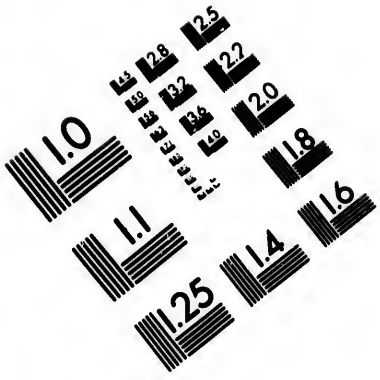

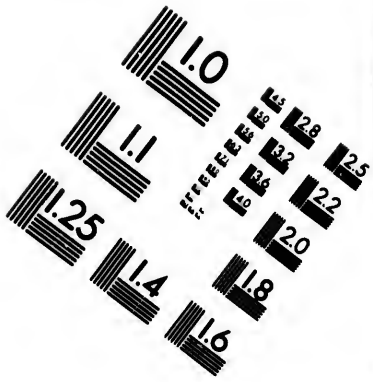

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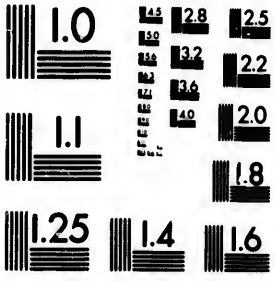

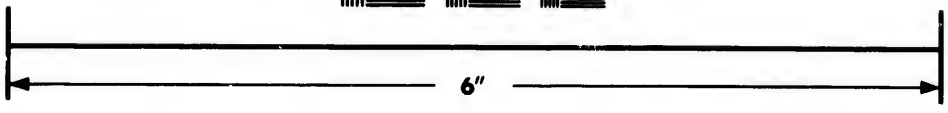

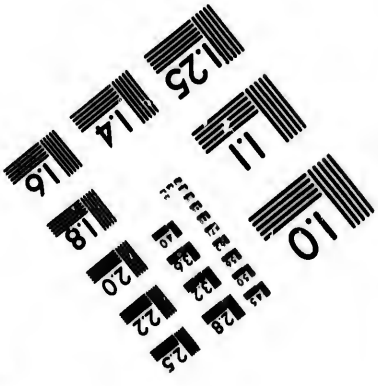

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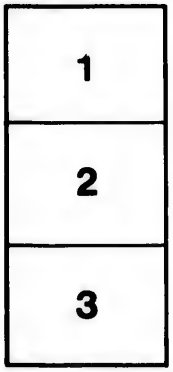

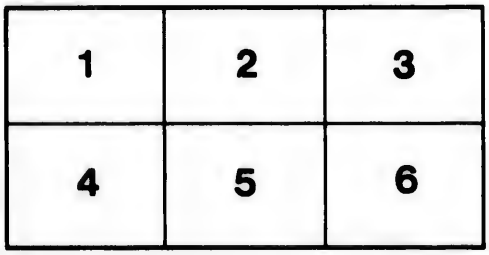

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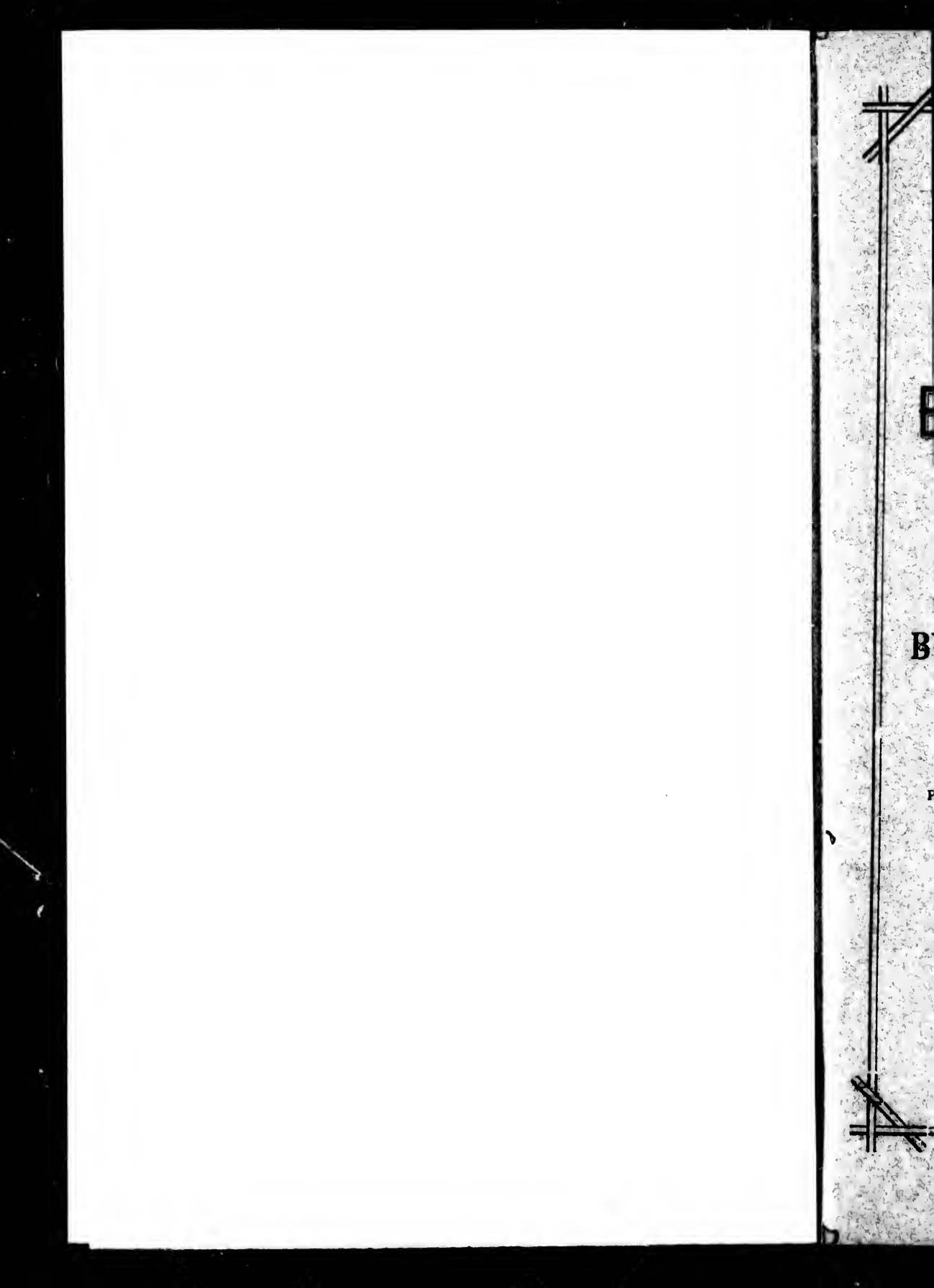


COMPARISONS

OF

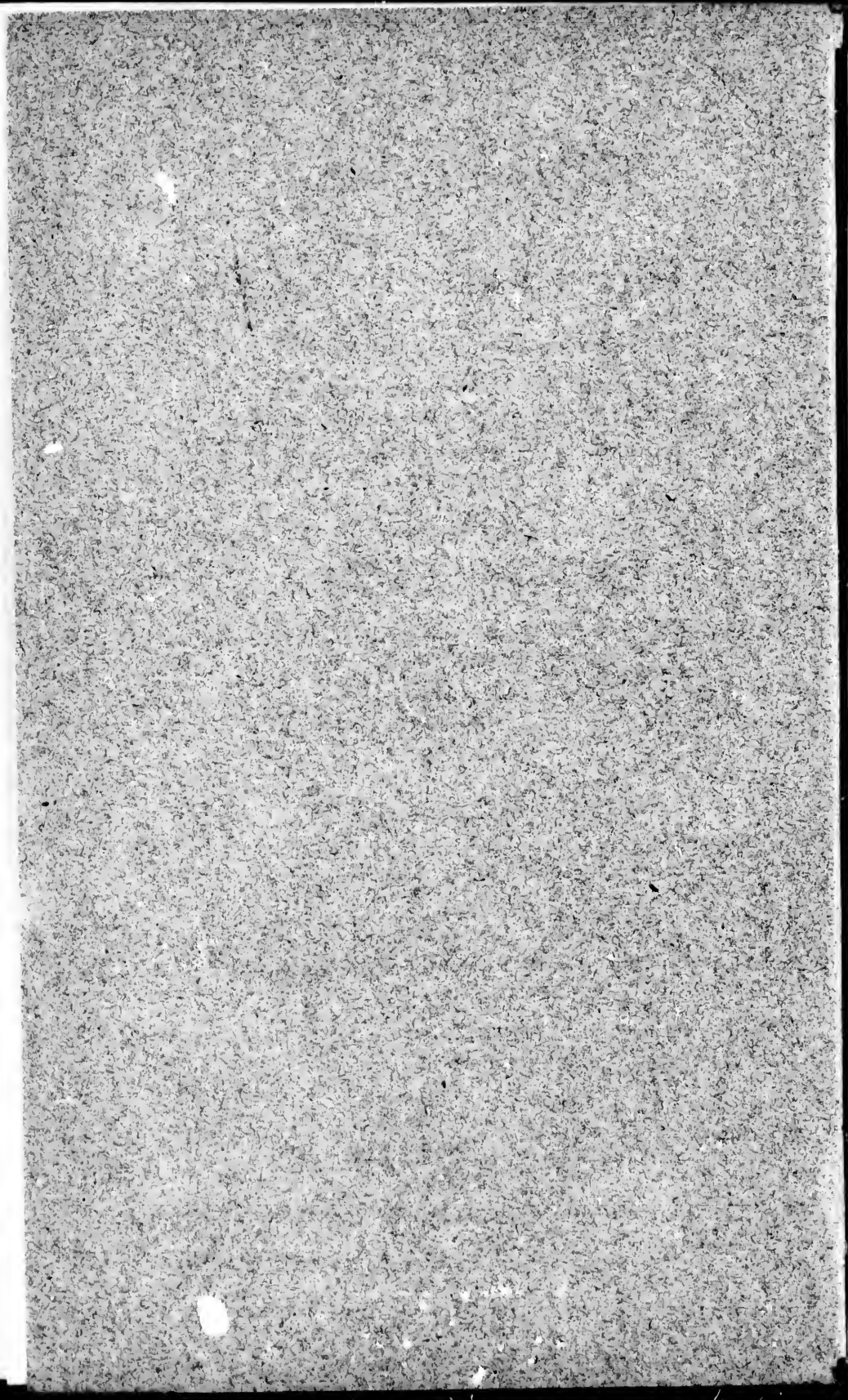
ENGLISH & AMERICAN

FARMING.

BY ALFRED C. THOMAS, C. E.

PUBLISHED UNDER A GRANT OF THE LEGISLATURE OF NOVA SCOTIA.

WINDSOR, N. S.
C. W. Knowles, Printer and Publisher,
1880.



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COMPARISONS

OF

ENGLISH AND AMERICAN FARMING

IN CONNECTION WITH HARD TIMES,

And a Synopsis of the Theory and practice of Tile Draining from the writer's own experience;

ALSO ON THE

Management of a Hundred Acre Farm

SHOWING

Dr. and Cr. Account, and according to the principals enunciated.

BY ALFRED C. THOMAS, C. E.

PUBLISHED UNDER A GRANT OF THE LEGISLATURE OF NOVA SCOTIA.

WINDSOR:

C. W. KNOWLES, BOOKSELLER AND PUBLISHER,

1880.

INTRODUCTORY.

The writer considers it necessary, before bringing this Pamphlet before the Public, that certain explanations and remarks should be made as the MS has been written some few years awaiting an opportunity for Publication.

The object in writing at all, had been principally to prepare the public mind for the introduction of some radical measures into the House of Assembly for the benefit and assistance of the Farming Community, principally the passage of a Drainage Act similar to that of Ontario, and also and even of more importance, the establishment of institutions for the advancement of loans given on collateral security for longer periods than can be obtained in this Province, the shortness of time given rendering all money lending institutions perfectly useless to our Farmers. Altho' this latter subject has been hardly referred to at all in a direct way, the writer, feeling that so much prejudice existed, that it would be better to bring about the desired results by drawing comparisons by analogy of what the actual positions of the farmers of different countries were, hence the article entitled "Comparisons of E. & A. Farming." The object was also to endeavour to get the general Public to take more interest in this branch of industry, by showing them plainly that it is clearly to their interest to do so, for I firmly believe that in a depressed state of agriculture no one suffers so little as the Farmer himself, for the researches of DeVille at Vincennes, Lawes and Gilbert and others have shown that land hardly ever becomes completely exhausted, so that with a mowing machine and horse rake, a farmer can run over his fields annually at little expense, and collect enough to afford him a bare living; but he is neither in the position to buy manufactured goods, luxuries or employ labor, and this accounts for the great prejudice in America among a certain class against machinery. The English farmer increases his rotation by machinery, cultivating more land, and employing more labor, because he can do it with profit. A certain prejudice exists against the English System at present on account of what has lately transpired, but the reader must recollect the enormous difference between the two countries: one a Continent with every variety of climate, the other a small Island that Mr. Howe said could be put into one of the Canadian lakes without raising the tide; and the complaints are not by any means all on one side, for we have letters from Englishmen settled in Colorado, who would far rather be paying a heavy rent in England. However, I have endeavoured to review the systems impartially, and should be in a position to do so, for I believe in neither entirely, but should it be necessary in the future to make great alterations in the English system, it will also be necessary to abandon the American one if possible entirely. If any reader should doubt this let him examine the map, and see the enormous quantity of territory, both in the United States and Dominion, that has been run over and exhausted in so short a time.

Where are the wheat fields of the United States to-day? In the land of the Dakota. The enormous exportations of grain prove little, for the same rule applies to the wheat farmer that does to the hay-maker. But whatever may be the difference of opinion on this great question, the writer cannot but think that the English practice is founded on rules of sound political economy, which may be condensed as follows: That every working man, no matter what he may be, Farmer, Manufacturer, Shopkeeper, should have the control of his own capital, as an auxilliary to his brains; that Farming is an unprofitable business individually, but collectively it adds more to the wealth of a nation than anything else, consequently to induce individuals to undertake it a system has been introduced to make it as profitable as possible in the way hereinafter explained.

One thing is quite certain, and that is that as long as the merchant and trader can do business by advancing only a small portion of his own capital, augmenting it by loans, while the improving farmer has to invest the whole of his, it is useless to suppose that the evils of over trading will ever stop, or farming advance, it is simply a matter of percentage, if a farmer can with all his labor and skill, only realize the same as by investing his money, then few will undertake the business, while should a fair profit of 18 or 20 per cent accrue, I think it would be an exceedingly popular pursuit. and only under some very great change of system can it be made thus profitable. There are certain matters that should have been decided in this Province by this time in connection with this project, and that is what is problematical, and what possible, or rather impossible and the making farming pay under our present system may be classed as an arithmetical impossibility. I do not refer to practical farming, as the reader can easily see by referring to my description of the working of a 100 acre farm, of which the general idea may be erroneous, but the figures hold good relatively. I do not affirm that every one who has these advantages given can make farming pay, but I possitively assert that without them he cannot. A command of a floating capital will, of course, entail better farming, consequently better educated farmers, or as an old Scotch farmer answered the writer when asked if he did not think he would do better in England on a rented farm, "Mon ye would either do better or worse."

My attention was drawn to these matters entirely by my own experience, I found that with all the care, skill and economy that could possibly be used, a judicious outlay for machinery, and an economical system of tile draining, that failure must be the result. I have since seen my farm carried on under a different management, or by what is generally called in this country, Practical Farming, and the result has been exactly what I anticipated, neither more or less. I also find that the very things I advocated and carried out fifteen years ago, are rapidly meeting with general approval, notably tile-draining (which bill passed the second reading in the House last year) the extensive use of artificial manures, and using less composts and marsh mud, &c., &c.

But with all these improvements, the remedy for the whole diffi-

cult- lays in the farmer's capital, be it small or be it great, being properly applied, and this can only be brought about by Legislation or as the mover of the answer to the Lieut. Governor's speech stated in placing the farmer on the same footing with other professions and businesses. I say Legistation, for it must be recollected that in this country, farming has been completely driven out of the field for a number of years by an unfair competition with other interests, the failure of which tends to re-establish it on a better basis, but it cannot for a moment be supposed that this can be done by private individuals or companies. A few words in consideration of the charges generally made against the farmers on account of their supposed unbusiness-like habits and recklessness. I think the impartial reader will come to the conclusion after perusing the first part of this Pamphlet, which shows the position the farmer should be in, that he has hardly had a very great chance given him lately, particularly as he is entirely cut off from sharing any benefits in the monied institutions of the country, not but what farmer's notes are occasionally accepted, but they are not as a class celebrated for helping one another. Besides which the business of agriculture is of far too great great importance to the country to be checked and made insecure by the caprice or tyranny of any body of directors. I know of no cases of this kind myself, but directors are only human, and are vested with much power for good or for evil. The only security against anything of this kind is the establishment of an institution where money is advanced on articles of value, and where thorough experts are employed to ascertain if the security is sufficient. I think it will be seen that Nova Scotia is exceptional in the treatment of her farmers, and as a celebrated writer observes, "When any section of the popul[illegible]n of a country are unfairly treated, the result is sure to be [illegible]llion or depopulation." So I am afraid, as we farmers have no one to rebel against, we shall have to take the alternative.

The writer would call the readers attention to the following extract from *Harper's Magazine* of August, 1879, taken from an article entitled "The Foreign indebtedness of the United States," showing the similarity of views entertained.

Secretary Sherman, in his report for 1878, writes: "'The increase of our exports consisted mainly of breadstuffs, provisions, agricultural implements, iron and manufactures of iron, copper and manufactures of copper, leather and manufactures of leather, and petroleum.....Of the exports of domestic merchandise during the year, the products of agriculture comprised seventy-seven per cent., and exceeded the entire value of our imports of all classes of merchandize from foreign countries. The exports of these products have risen from $361,852,972 in 1872 to $536,039,951 in 1878, and the capacity of their further increase would seem to be limited only by the demand thereof.' On account of this increase in raw production, food and necessities will be cheapened, because of the increased supply, thus allowing more use for luxuries, and giving employment to many embarrassed industries, while the increased

number engaged in producing necessities will also create a demand for other products. Nor will activity await the entire payment of our foreign debt. This flow of capital and labor toward raw production will soon balance the forces of the country; the rate of interest will rise, capital will be sought, Europeans will gladly lend to us, imports will increase, and so on to prosperous times."

"It is a normal condition of a young and growing country like the United States to demand capital for new enterprises. This capital Europe is glad to loan us, as we can afford to pay her a high rate of interest."

COMPARISONS

OF

ENGLISH AND AMERICAN FARMING,

IN CONNECTION WITH HARD TIMES.

CHAPTER I.

REFERS TO HARD TIMES IN AMERICA, PARLIAMENTARY COMMITTEES AND PUBLIC JOURNALS HAVE NOT ARRIVED AT ANY VERY SATISFACTORY CONCLUSION AS TO THE CAUSE AND REMEDY, TO PREVENT RECURRENCE; INCREASED ATTENTION TO AGRICULTURE APPEARS TO BE THE ONLY REMEDY SUGGESTED. CHANGES IN AGRICULTURE REQUIRE TIME TO DEVELOPE THEMSELVES. IS AGRICULTURE ON A SOUND BASIS IN AMERICA? GENERAL COMPARISONS CAN BE MADE WITH ENGLISH SYSTEM OF FARMING WITHOUT THE WORK IN DETAIL. ENGLAND HAS SUFFERED FROM HARD TIMES AS MUCH AS AMERICA. THE LATTER COUNTRY'S LARGE AREA MAKES HER COMPARATIVELY INDEPENDANT. HARD TIMES BROUGHT ON BY MANUFACTURES AND TRADING OUTSTRIPPING AGRICULTURE. ADVANTAGES GAINED BY KNOWING WHERE THE REAL TROUBLE EXISTS. OVER-TRADING STILL LIKELY TO CONTINUE. AGRICULTURE MUST BE MADE MORE PLEASANT AND REMUNERATIVE. THE PROVINCE HITHERTO HAS BEEN INDIFFERENT TO AGRICULTURE, THE PROFITS OF SHIPPING BEING SO MUCH LARGER. MORE ENERGY MUST BE SHOWN IN CONNECTION WITH AGRICULTURE, TO CORRECT THE EVILS OF OVER-TRADING.

For the past few years the world at large has been suffering from what is generally denominated hard times; and perhaps of the English speaking part of it, the United States and the Dominion of Canada have suffered as greatly as any other portion, considering the large extent of available land they have at command, where they are not *compelled* to condense their population into a small compass, as is the case in Great Britain.

It would be natural that were interests of such magnitude are concerned, that the cause of such depression should be carefully singled out, so that a remedy might be sought, as soon as possible, so that besides the varied discussions in the Public Journals, Parliamentary Committees have been called together to sift the matter thoroughly. That no light whatever has been thrown on the matter, it would be unfair to state, but the careful investigator cannot but notice that the whole mass of evidence given collectively is only the united opinions of men viewing the total disarrangement through the limited scope of their own particular business, or of their own particular locality.

The fact that over-trading has brought about the present crisis, cannot be denied, and the public appear to accept this idea as conclusive, and trust to time to bring the proper remedy, and restore all things to a proper level.

There certainly appears to have been generally a great lack of information on the subject. No one appears to have ascertained the reason for over-trading, or to have devised any satisfactory means for checking this tendency in the future; neither is the proposed remedy to leaving matters to be rectified by time, at all more satisfactory.

We think that any private individual, finding himself in embarrassed circumstances, would much rather trust to his chances for extricating himself, to his increased energy and assiduity, than to wait for the slow process of economy to enable him to recover his position, and it would certainly be more satisfactory if we could look with confidence to the increase of any branch of industry to meet the enlarged proportions of the present trade and manufacturies, than to await the necessary curtailments that otherwise will require to be made to establish the proper equilibrium.

The only source that has been positively pointed out, from whence this increased stimulus can proceed, has been from agriculture, as the Minister of Finance of Canada in his Budget speech regrets the comparatively short crops of the last two years, and looks with hope to the future to relieve the country from its present depression by a bountiful harvest. Could these anticipations be reduced to matters of positive certainty, the task of quiet submission to the present would be much ameliorated, but unfortunately it has been shown that in almost every line of business, and every enterprise the experience of the past, is only valuable as a guide for the future, when proper provisions, and precautions are taken to make the recurrence of the same disaster an impossibility. That this has been done in America appears to be almost too much to expect, as all important changes in agriculture require great time in their development, and are only brought about by degrees.

Being satisfied that it is from the increased production of this source of industry, that amelioration of the times must proceed, it would be well to enquire, and ascertain whether the whole system of agriculture of northern America at large has been placed on such a thoroughly sound basis, as to give promise for such bright hopes

for the future. It would be well to look to the management of this industry in England, not that it is by any means possible, or advisable to imitate their general methods of carrying out this work in detail, but to ascertain by what process of management, the comparatively limited capital of American farmers can best be invested for individuals, and the general benefit of the country.

It may be remarked that it is useless looking to England for an example, or for means to overcome our difficulties, as she has suffered nearly as much as we have, and from the same causes—overtrading.

This is perfectly true, but then it must be recollected, that in her case it could hardly be prevented. On account of the large accumulated wealth, and the comparatively small area of the land, the English have been compelled to invest in doubtful speculations to obtain any interest for their capital at all. There can be no doubt that could the area of land of Great Britain be doubled, that many millions of pounds would have been employed in working and developing it for the good of the country at large, instead of drifting off to build unpaying railways, and prop up impecunious Governments.

The money invested in England, in agriculture, is enormous, more than many people unacquainted with the subject could possibly believe, altho' Mr. Mechi and others state that even now the country is not half farmed.

Now, with ourselves, and our neighbours in the United States the case is different; we have an unlimited quantity of land lying at waste, and if we bring on hard times it is entirely our own fault, we develop manufactures, and all rush into trade, because the profits are larger and the returns more direct, and because much less scientific knowledge is generally required; while the more difficult branch of agriculture, upon which all these depend, is left to languish, or at least is completely outstripped by its auxilliaries.

I have assumed from the remarks of the Minister of Finance, that the only hopes of the future are in the increased prosperity of the farmer, but the prevailing idea in Nova Scotia, at all events, with a great many, is, that other branches of industry are of a great deal more importance, and it is a very common thing to hear the remark made when speaking of hard times, that shipping is what the prosperity of the country mainly depends on. But a closer investigation will soon show as in the case of the evidence before spoken of, that the speaker can only view the subject from a narrow contracted point of view in connection with its bearings upon his particular business.

That the profits of shipping individually are enormous, there can be no doubt, but it is unfair to make a comparison between it and agriculture as they now stand, for the one is fully developed, the other only in its infancy.

It is of very great advantage to be able to point out one branch of industry, to which we entirely look for the uplifting of the present cloud of depression. Our whole energies can then be exerted

to establish it on a sound basis, and to assist in its development.

It having been shown that the whole evils of over-trading have been caused by the depression in agriculture, causing the demand for manufactured and imported goods to be too limited, the next question is how can the proper balance be most easily restored? To wait till the stock of traders and manufacturers decrease for want of customers, as advised, would, to say the least, offer but a gloomy prospect for the future, for no other business would be likely to offer itself to this class of people and their dependants, and they would consequently be compelled to fall back on the soil, on the very industry, which its want of profits had led them to previously avoid, it is not at all probable that such a course will be adopted, and half a cake will be preferred to none at all, and the evils of over-trading continue, unless the demands of agriculture are made equal to the supply of goods, which result can only be brought about by making the cultivation of the soil as profitable; pleasant and honorable a position as any in the land: and to arrive at this desired result, a great deal of Legislation, and a great change in Public opinion and sentiment is necessary.

CHAPTER II

SHOWS THE GENERAL POSITION OF THE ENGLISH TENANT. REMARKS OFTEN MADE IN AMERICA ON THE SUBJECT SHOW WANT OF REFLECTION. THE SYSTEM REVIEWED IN CONNECTION WITH ITS EFFECT UPON THE GENERAL PROSPERITY OF THE COUNTRY. THE AMERICAN SYSTEM HAS HITHERTO SUITED THE COUNTRY. THE ENORMOUS AMOUNT OF CAPITAL INVESTED IN FARMING IN ENGLAND, AND MONEY PUT IN CIRCULATION THROUGH THE SAME MEANS. IF TENANT FARMERS WERE COMPELLED TO LOCK UP THEIR CAPITAL A FINANCIAL CRISIS WOULD OCCUR. FARMERS' CAPITAL LOCKED UP IN AMERICA. THE EFFECT OF THE SYSTEM ON THE TENANT INDIVIDUALLY. DIFFERENCE BETWEEN PERMANENTIVESTMENTS AND WORKING CAPITAL. POSITION OF THE TENANT NOT FULLY UNDERSTOOD IN AMERICA. TENANT IN A MORE INDEPENDANT POSITION THAN A FARMER ON A MORTGAGEDFARM. REVIEW OF THE GENERAL POSITION OF THE AMERICAN FARMER. PIONEER FARMERS HAVE THEIR DIFFICULTIES. VERY DIFFICULT TO GET OUT OF A BAD SYSTEM OF FARMING.

It is well known that in Great Britain, few farms are worked by the owners of the soil, but are let to tenants under various agreements, who pay a certain amount per acre per annum, under the denomination of rent. How the system originated, or in what way it is not my province here to enquire; but it certainly dates back to a very early period. To state that it has given universal satisfaction would be untrue, both parties to the agreement have, at various times, had serious complaints to make; the former, that the interest returned to them for the value of their land has been small, and that it was difficult to keep the occupant from injuring the property; the latter, that they had no security for capital spent in necessary improvements, for want of proper leases, that they were often tied down and crippled by foolish regulations, and that they were generally in too dependant a position.

It is not my intention to enter into the general merits or demerits of the case from an English point of view, beyond stating what is well known to be the case, that Legislation is constantly going on, removing these difficulties, so that every year the two parties nearer assimilate to the positions, that any one in another business, hold, where mutual obligations are necessary.

The satire and abuse often poured on the English tenant farmers by American writers, is as ungenerous as it is ill-timed, and as is often the case, when these ultra opinions are expressed ;it is the result of want a of reflection; hasty judgment, and a general ignorance of of the whole bearings of the subject. If the tenants are anywhere in the condition of dependants, that would make them liable to be classed as serfs, &c., it must be looked upon as the relics of feudalism and barbarism, that the march of civilization has not as yet thoroughly swept away, more than as any indication that the system itself is thoroughly bad, or that mutual obligations cannot be entered into between two parties, landlord and tenant, advantageous to them both, and conducive to good feeling, and to each holding both a honorable and an independent position.

I have before remarked, when speaking of myself in connection with tile-draining, that the world at large judges hastily, and seizes on the most prominent part of a subject, without taking the trouble to investigate it thoroughly, unless it happens to be deeply interested in it, which, in this age of rush, is not very likely the Americans are, in the relation of landlord and tenant in England ; consequently they strike on the most prominent fact, that is, that men have to pay a large rent in England, for what they can get in America for nothing, and that in addition to that burden, they are liable to be turned out of house and home at the mercy of a tyrant, whenever he thinks proper.

The subject may be viewed from two different points:—Firstly, the direct and indirect effect of the system adopted in England, on the prosperity of the country at large ; secondly, the advantages or disadvantages to the tenant or worker of the land.

An old magazine says of agriculture, thus viewed in its most extensive sense: "it divides itself into two great branches, territorial economy and husbandry ; the former, including the improvement and general management of landed property, the latter, the manual practice of agriculture." If we wanted to jump at conclusions rapidly, we might say at once that in the management of the former branch, America had shown herself decidedly difficient, in fact, so far from a general improvement in land—thousands of acres have been exhausted and then thrown aside as worthless. It is well known how the centre of American population has been steadily progressing towards the west, following the virgin soils, and the fact that during a panic, land and farms depreciate in value more than any other stock or property, show at least that the American system has not had a tendency towards Territorial Economy.

It may be urged that in America the abundance of land is so great as compared with that in England, that no comparison can

be drawn in this way, and that it says nothing or proves nothing in favor of a tenant and landlord system; but I think it can be shown that it is the check that such a system gives, that prevents land from being treated in the same way in England, not but what it is quite natural and justifiable for new settlers in a new country, to take whatever advantages they can of their position, and I look upon the fertility of the virgin soils as a wise provision of nature to assist and sustain them in their first efforts, and while condemning the American abuse of the tenant farmer, I cannot but sympathize with, and admire the independent spirit which would prefer being unfettered by any obligations to another party, and the question to be ascertained is, whether by investigating the subject, we may not be able to derive great advantages by adopting what is advantageous and rejecting what we do not approve of.

I have no reliable statistics of the area of the good farming land of Great Britain, or of the amount of average tenant capital employed per acre, both of which would be necessary to give the information I desire with some degree of accuracy—but I think I have read a statement somewhere, that the amount of arable land in Great Britain consists of about fifty million acres. Now assuming this land to be worth fifty pounds per acre on the average, then at three per cent, this would give an annual income to the land owners of one hundred and fifty millions, while the tenant, or working capital, may be put down at ten pounds per acre. Of this amount, perhaps about one half would be spent when the farm was first occupied, and the remainder annually in artificial manures, feeding cakes, repairs, wages, &c. Now this would give a yearly expenditure from agriculture alone, of over three hundred millions of pounds. A nice little sum, it must be confessed, to be put into circulation, and independent of all the results and disasters that may occur from overtrading. Now what have we in America to represent this? Why, literally nothing to fall back upon, with any degree of certainty. The revenue to the owners or property may be great or may be almost nothing, both because the land has not been kept up to a fixed standard of fertility, and also because no system has been adopted that will ensure a sufficient working capital to be applied, to properly develop the resources of the soil.

The land in England is valuable, and a certain income to the landlord, and indirectly to the country at large, only on account of the certainty that enough capital will be applied to it to work it properly, and to advantage, and not by any means on account of its locked up and accumulated fertility, as is the case in America —for—this the farmer dare not infringe on, as he is compelled to leave his farm in the same state of fertility that he finds it.

The best comparison that I can make to illustrate the idea, is, that the land may be compared to a line of railway, built between two populous towns, and where the traffic is sure to be large; now this line would be valuable or worthless, according to whether the company had means to equip it with rolling stock or not. Suppose circumstances should occur to make it necessary for every English

tenant farmer to devote his working capital to the purchase of his farm, what would be the result, nationally? Why, it is harder to imagine anything that could cause a greater crisis in the country. The whole machinery in connection with agriculture would be disarranged, thousands of workmen would be thrown out of employment, not only those immediately connected with the farms, but also the assistants employed, in all branches connected with farming, the agricultural manufacturies would all be stopped; the working of the brick and tile yards, and lime kilns, the bone and special manure factories, and thousands of tons of shipping used for carry-feeding cakes, guano, &c., would be thrown out of employment. And yet, when we come to consider matters, is not this exactly the position we are in, in America? Our capital is locked up in our farms, and we have not the means to work them properly. It does not matter whether they have been purchased or made by a life-time of unceasing toil, they represent so much accumulated capital, and to make the matter still worse, a trade has been built up on an unsound basis, during days of prosperity, and when virgin soils easily gave forth their abundance.

It may appear to be absurd to trace the depression in Nova Scotia to these causes, as hard times apparently only date back a few years. But is this really the case? It appears to me the outcry commenced over twenty years ago, or as the oldest inhabitants say, "when our crops first commenced to fail;" and after that, exceptional circumstances gave the business of the country an unusual stimulus. First, there was an expenditure of several millions on Public works; then the American war broke out, and the carrying trade was entirely transferred to British bottoms, and also the coal trade was developed by the closing of the Pennsylvania mines. That some portion of this prosperity remained for a while, cannot be wondered at, as it took our neighbours some time to recover from the disarrangement caused by the war, so that, judging by all these circumstances, we cannot wonder at the general depression.

Thus viewing the system of agriculture, in England, from a national point of view, we cannot but think that it is established on a basis which, at least, conduces to the prosperity and well-being of the country, and we will endeavour to see to what extent the worker or tenant is benefited

The country or system that is best for any man is, that in which he can, as the saying is, "get along best," I do not intend to refer to merely laboring men, with only their own hands to support them, as this is not a pamphlet referring to the general advantages of immigration, but only to those who possess a certain amount of capital, in what way can they invest it in farming to the best advantage in America? The greatest success that attends the investment of capital, is where the greatest amount of interest is procured with good security. It will be readily conceived that when a man takes control of his own capital, in a business that he is thoroughly conversant with, he has a right to expect a much larger return than he would get by an ordinary investment. At the same time

he runs a greater risk. Now in England, a tenant farmer, by keeping the control of his capital, or keeping it floating, has a valuable auxilliary in enabling him to carry out undertakings as a farmer, and it is only under this system that he could possibly be placed in this position. The difference of the whole system and tendencies of English and American farming, are so great, that they can only be called branches of the same business. The English farmer is legitimately a manufacturer of organic and inorganic matters, or in plain words, manure into food, and produce directly as in the case of wheat for food for man, and indirectly as when growing turnips, &c., to make meat, of course certain processes and adjuncts are necessary before this can be done, and the more a farmer is able to control his capital to the direct end in view, the greater will be his profits.

The mere turning of manure into produce, could it be done by some wizard invention, of *ho, presto!* operation would be exceedingly profitable. As it has been ascertained that articles used as feed for man are worth ten times as much as the value of their manurial ingredients, but before this can be done, a variety of expenditures have to be incurred, which, although unprofitable in themselves, are all necessary before the desired consummation can be arrived at. This being the case, it is quite clear that the less of these expenditures the farmer takes upon himself, and the more he throws upon others, the greater will be his profit. Among these expenditures are, first, the control of land, the use of expensive buildings, the expense of drainage, purchase of machinery, of manure, &c. It cannot be supposed that other parties can be expected to cover the whole expenditure, leaving the farmer the whole profit, so that certain portions are set aside for which he only pays for the temporary use, and these are generally the land and the drainage, and as they are lasting and stationary, they come under the denomination of permanent investments, and rarely produce more than three per cent, so that the farmer is left completely unfitted to carry on his legitimate business, having had a great lift given him toward the desired end, by getting rid of the greatest outlay at a moderate rental. But in spite of the system that gives the farmers such a control over their capital, theirs is not considered a profitable business.

Farmers are not likely to create a panic by over-production. I never expect to see the day that all the professional gentlemen have shut up their offices to turn farmers.

Many complain that the rents are too high, and then the landlords say they do not put capital enough on, but if dissatisfaction exists, it would be well to examine the position of the American farmer, and see how he fares in general.

Although I should have mentioned before, that it must not be supposed, that the English landlord realizes three per cent on a valuation of fifty pounds per acre on his land alone, as he is called upon to invest a great deal of money in building and improvements, so as to fit it for immediate occupation by the tenant.

I have no doubt but that in many cases the landlords do not get

much more than a fair return for their investment and improvements, letting the land go for nothing. Neither is tenant farming universally unprofitable, for many farmers have realized large fortunes out of the land—even as tenant farmers,—as a member in the Upper House of Nova Scotia remarked, when expressing dissatisfaction at the annual expenditure of the Central Board producing so little, but I should say because they are tenant farmers, it is the constant recurrence of these remarks in America, that has convinced me that the position of the tenant farmer is not understood, and the judgment has been formed only from the most salient point of the case. Many poor men, even laborers, have risen to be farmers of wealth and standing in Great Britain under the tenant and landlord system, which has enabled them to apply their small capital saved from days labor, to the direct and most profitable branch of agriculture, i. e., turning manure into produce. While had they been compelled to purchase, or even prepare the land by drainage, &c., the capital would be irretrievably and uselessly sunk.

It would be a similar case with a merchant or shop keeper, who was compelled to purchase his wharves and stores, so as to swamp his capital, he would of course soon be ruined by assuming what was not his legitimate business, and becoming a proprietor instead of a dealer.

How laboring men generally acquire sufficient capital to commence farming as tenants, I cannot say, but in all probability, if they show extraordinary ability, they are able to borrow it, at from four to five per cent, where if they can realize ten per cent by farming, their clear gain would be six per cent, then as they accumulate capital they take larger farms, or more of them, until they ultimately become wealthy men, which they could not do under any other system than that of tenant and landlord, for it must be apparent to the reader, that if the tenant can make ten per cent, and can work improved land, for which he only has to pay three per cent, then every hundred pounds that he invests to become the owner of his land, mulcts him to the extent of seven pounds. This is actually the way the tenant is situated in England, and before we listen to one half that is said about them in the American papers, we had better pause and consider whether we are not by our own recklessness being driven into a position that will make it not only advisable, but absolutely necessary to adopt, at least, the principle of the same system, gaining what advantages we can without putting ourselves in too dependant a position, or imaginary dependant position. For in what respect a tenant cannot be in as dependant and honourable a position as a farmer owning his own land, but upon which another has a mortgage, I am at a loss to say. In the former case the capital is all floating, and by the laws lately made, all improvements and unexausted manure must be paid to the tenant in case of removal, while in the latter case, a mortgager is completely at the mercy of the mortgagee, and particularly in America, where landed property is liable to so great a depreciа-

tion, he can be turned out of house and home at a twelve months notice, with the loss of the improvements of a lifetime, and without the least redress.

The American farmer gets possession of capital, in either one or the other, of the two following ways, by inheritance or by accumulations gathered in business or while under employment. When farms are purchased in America it is rarely that sufficient capital is reserved to improve them to the extent that will make the cultivation profitable. The greater portion of the capital is expended in purchasing, so that it is completely locked up, and this is unadvisable, as few farms are sold in this country that are not more or less exhausted. Occasionally good bargains are made, and by great skill and economy, the owners of the land ultimately become independent men But this is the exception, more than the rule.

The desire to own a farm perfectly free of encumberance, is both natural and honorable, but the means taken to accomplish that object; often have a tendancy the other way, and bring about the very annoyances that are so desirable to avoid.

Most American farmers would consider it madness to reserve their capital for working expenses, and purchase on credit, and the consequences are, that they generally are compelled to adopt an unprofitable style of farming, which robs the farm and necessitates the borrowing of money on mortgage, the interest of which has to be paid from an impoverished, undrained soil. And it is in this state, that too many of our farmers are at the present day. Whereas, had the purchase money been retained to put the farm in thorough working order, the abundant crops would easily have paid the interest, and the mortgage could be paid off by degrees.

Many farmers in America have become independant by their own industry, some by constantly following up the virgin soils, others by settling down and building up a valuable property about them.

I will endeavour to trace what would, in all probability, be the history of many of the latter:—A log house and hard times seem to be the usual accompanyments for a number of years, but abundant crops are encouraging; as civlization increases, and the family grow up, a more comfortable style of living is found to be advisable, better dwellings and barn accomodations are required, and all the little numerous etceteras, that take time and labour, but are not begrudged, as they add to the home-like, and domestic appearance of the place, and surely to its value, so the farmer argues, and so things go on; there are no semi-annual visits from a baliff, to remonstrate on the impropriety of selling so many colts and head of young stock, without returning the equivalent in phosphates, if the land gives a gentle reminder, the farmer contents himself with the remark that times are not what they used to be, crops will not grow now, and if a chance traveller comes along and suggests heavier manuring and draining, he will tell you that he has no money, his additions to buildiugs and sprucing up the place has taken all his available capital, as he has no landlord to do this work. If, he is

fortunate enough to have a family of working sons, things may get along pretty smoothly for a while, but at last even they begin to get tired of never having a dollar in their pockets, while they see mechanics and others drawing the highest wages. Neither does the farm improve, so as to offer better hopes for the future. Then comes the last and worst of all, the sons flock off to the cities and enter stores, &c., wages have increased and crops decreased, it will never do to feed hay at three dollars a ton, which is all it will pay when fed to stock alone, while fourteen or fifteen dollars can be realized by taking it to market, without the labor of feeding stock and hauling manure. This plan succeeds for a few years, till the yield decreases from two and a half to two tons to the acre, down to one, and at last to not enough to pay for putting up and hauling. Then follows foreclosure and ruin, and the harm does not end here only, for the mortgages due are not recovered, capitalists become disgusted with letting money in the country which they never can recover, and prudent farmers, who have accepted small returns, looking more to the advantages of the future, in increasing the fertility of their farms, are entirely cut off from the advantages that the possession of a little ready capital sometimes gives. So that at the present time, if we can believe the papers, the country is covered with farms that cannot be sold at one fourth the value of their improvements.

CHAPTER III.

THE COMPARISONS OF THE ENGLISH AND AMERICAN SYSTEM ONLY MADE FOR THE PURPOSE OF INTRODUCING INNOVATIONS, NOT TO CONDEMN EITHER. NEW WORKS THAT ARE INTRODUCED SHOULD BE SELF-SUSTAINING. THE LAND BEARS TESTIMONY TO THE BAD SYSTEM OF FARMING THAT HAS BEEN PURSUED. IT IS DESIRABLE TO COMBINE THE ADVANTAGES OF THE ENGLISH AND AMERICAN SYSTEMS. FARMERS MUST KEEP CONTROL OF THEIR CAPITAL. LESS RISK IN HIGH THAN IN POOR FARMING. GENERAL DETAILS OF DRAINAGE SCHEME. LOAN SOCIETIES TO ASSIST FARMERS. NECESSARY FOR THE GOVERNMENT TO FIND THE FUNDS FOR DRAINAGE. THE CAPITAL BEING LOCKED, THE REAL AND ONLY CAUSE OF AMERICAN FARMING BEING SO UNPROFITABLE. A FARMER MUST NOT SWAMP HIS CAPITAL IN PERMANENT INVESTMENTS. PROGRESSIVE SCHEMES SHOULD NOT BE LEFT ENTIRELY TO PRIVATE INDIVIDUALS TO CARRY OUT. AGRICULTURAL PAPERS OFTEN NOT PRACTICAL. MERE IMPORTATION OF THOROUGH-BRED STOCK NOT SUFFICIENT.

It would be interesting to ascertain at what period of fertility the advantages balance in favor of the tenant farmer. While crops are abundant, any farmer has an immense advantage in not having any rent to pay, and when no calculations are made for returning anything to the land, but small capital is required to commence operations; so that it is said, that out in the Western States all that a man wants is a plough, a pair of horses with harness, and harrows,

and his seed grain; as the wheat is threshed out by shares. But unfortunately, the pioneer has disadvantages to contend with. Neither are the crops taken from virgin soils, anything like those realized by high farming. As I see from a statistical account that the average crops of grain in the different States, that the highest wheat returns are of Minnessota, California and Texas, and the highest average being from eighteen to nineteen bushels per acre. It is hard to say what price the farmer realizes per bushel, but I should think not more than a dollar. So that about twenty dollars per acre, may be assumed, to be the greates treturn in cash that can be expected from pioneer farmers.

In England, twenty-eight bushels per acre of wheat is about the average crop, but with high farming there is no difficulty in producing thirty-five; which at one dollar and fifty cents per bushel, would give a return of forty-two dollars per acre, but then this result is only brought about by expenditure of capital and a rotation of crops, in some of which the farmer may not realize anything like what he does in the wheat crop.

But to refer to the point at issue, at what stage of fertility does the position of a farmer, who owns his own farm, compare unfavorably with the tenant farmer? We should say the very moment that he takes the first step in progressive farming.

The prairie farmer has the choice of moving further west to new soils, or has to commence replenishing his exhausted land.

It may seem, to other than experienced men, that the task of changing the system of a farm by which the fertility may be kept up and balanced is exceedingly easy, but this is a great mistake. An old writer, speaking of the failure of gentlemen farmers, says, "the sight of a plough lying near a farmer's barn door, suggests the idea that farming must be a very easy and profitable business, when such a simple inexpensive implement is the main assistant, but they little know the host of expenditures that follow at its tail".

We have shown what a simple matter the mere collecting the yield of the virgin soil is, but suppose our farmer does not want to move west, but wishes to establish a home, what then? The crops have decreased perhaps to the value of ten dollars per acre, and as is always the case in instances like this, weeds have crept in and multiplied, dressings of artificial manures suggest themselves, as the cheapest way to renovate the land, but unfortunately they benefit the weeds as well, and small crops will not pay for a deduction of eight to ten dollars per acre.

It is necessary that a different system be adopted. A rotation of crops must be established, so that the land may be cleaned in sections. This involves an expenditure for wages, and machinery, and also drainage. So that when the first step is taken in the way of improvement, or rather when the farmer ascends in the social scale of farming, from being a mere sower and gatherer, he works at a continued disadvantage from being tied to a system which originated to suit the exigencies of the case, but which to persue and continue in the present, is not only unadvisable, but actually im-

possible. For if as has been shown, and has shewn itself visibly, that the American farmers have been unable to keep their farms up to a proper standard, and to maintain the efficiency of farming as it should be, when they had all the advantages of cheap labor and fertility in abundance, what chances have we in the present day, of success, if we do not adopt a different system, particularly as we have to restore what they have exhausted.

Whatever opinion may have been formed, as to the most desirable position held, either by the English tenant farmer employing his own capital, or the American working his own land, in which his capital is invested, I cannot say. Neither has my object, in writing the above, been to condemn the American farmer, or uphold his English brother, as both systems have been the birth of circumstances, that rendered them necessary to suit the peculiarities of the times and different countries, but I wished that the reader should thoroughly understand the positions in which each were placed, so that suggestions and ideas may be drawn by comparison, which may be of use in introducing innovations and changes into our own methods of farming, which are sadly needed.

Before attempting to suggest any means, that may be employed to alleviate the present depression, and prevent its constant recurrence in the future, it would be as well to review some of the remarks that have been previously made, regarding the unanamity of the opinions that has been generally expresed as to the cause that has produced these disasterous results, and as to the means taken to produce a change for the better.

It has not been my luck, in my desultory reading, to come across many articles that have deeply and thoroughly sifted the whole subject. But the various newspapers occasionally express opinions, some desicively, and with an opparently clear preception of the matter at issue, others in a desultory and doubtful way, as if uncertain as to whether they are on the right track or not, but affording sufficient indications as from which way the wind blows; while persons in authority do not hesitate to openly assert that it is to the increased produce of agriculture alone that we can look for a brighter future, which is equivalent to an acknowledgment that it has not been sufficient in the past. But beyond this, matters appear to be left pretty much to chance, and what few remedies are proposed, appear to be passive, more than active.

That it is the duty of the Government to suspend all public works that will not be self-sustaining, is manifestly, but an ordinary prudent measure, although the laboring class will be great sufferers thereby. So that now is the time, if possible, to introduce works which will be self-sustaining, and to which we shall refer to.

It appears to me that it would hardly be necessary to again refer to the fact of the soil of the Dominion of Canada in general, and the northern states, having become so exhausted by over-cropping, as the fact is so apparent to the most ordinary observer: but I am aware that many otherwise sensible men deny that it is the case, and ridicule the statement. One would think that the plain

testimony of the land itself, where thousands of acres are laying barren, with the marks of the plow still remaining on them, would be sufficient evidence, beside the additional testimony of the difficulty in growing abundant crops, without having to fall back on theoretical reasoning, which plainly shows that the system of farming that has been followed, could not possibly produce any other result.

With regard to the prospect for the future, it seems unreasonable to suppose that the farmers of America could rapidly relinquish an unsafe and unsatisfactory system, in favor of a better one. and even if they could do so, so, the results would not be immediately forthcoming.

The Upper Canadian farmers have long taken a position among the very first in America, but they cannot do impossibilities. Extraordinary misfortunes require more than ordinary measures to meet and obliterate them, and as far as my experience goes, the waiting patiently for extraordinary seasons is one of the most dangerous practices, that a farmer can be guilty of. The anticipated fortune never comes, and if this is the case with private individuals, it is equally dangerous to the nation at large. From what I can gather, the Canadian farmer suffers from the same cause that the Nova Scotian does, that is a want of active capital, without which his farm is of but little use.

In the remarks previously made, it must be apparent that, at all events, the system that leaves the farmer with his capital intact, however beneficial it may be to himself, is of an immense advantage to the country at large, as securing the circulation of a large sum of money, and also the employment and working of many branches of industry connected with faaming.

There seems to be a feeling prevailing in the United States that the time is approaching when wealthy men will become the owners of large landed properties, the same way as in England, and the farms will be sublet. Such an idea is repugnant to American ideas, and whether it will be carried out or not is doubtful, as it takes an immense amount of suffering to remove deep-rooted prejudice, so that any scheme that could be brought forward, that would combine the advantages of the English system, and maintain the integrity and independance of the American one, would meet with the hearty support and sympathy of the public.

I have before shown that the only permanent remedy for hard times is to make farming as profitable and pleasant, as any other business, so that agriculture may so increase as to be able to support the out grown branches of trade and manufacture.

I have endeavoured to show, as I believe, that this can only be done in one way, and that is by enabling the farmer to keep the control of his own capital, which is now locked up in his farm, and applying it directly to its legitimate use, as directly as possible; also by giving every facility to enable farmers to pay, by instalment, for all the most expensive auxiliaries of the farm, and so leaving him, that his capital will only be employed in the same way that it

is on a first class farm. In England, in this way, it is to be hoped that farming may become a much more profitable business, and conducted with much less risk. For it may be taken for granted that very few failures of crops occur from reasons beyond our own control, provided that we have the capital sufficient to remove the obnoctious causes. The even rents of England, where they are based on the average amount raised per acre, are a proof of the truth of this statement.

The most direct way to bring about these results, would be to adopt the English system of landlord and tenant at once, but this would be impossible, and also quite undesirable, for we could not find purchasers for the exhausted farms, and I, for my part, fully sympathise with the American feeling, that would wish to retain the fee-simple of their farms in their own hands. So that we must look further, and for other means.

The objects in view are two fold; to relieve those farmers who are struggling along on mortgaged and exhausted farms, and to offer superior inducements to small capitalists, to take up and work what farms can be purchased.

In the first case, any system that would include the borrowing of more money, would be unavailable and useless, as it could not be done unless it was for the purpose of introducing special work, which would be both self-sustaining and self-paying, for it is not probable that any farmer, who had been compelled to borrow money to pay off accumulated debts, could pay an increased amount of interest money, unless, by adopting an entirely different, and more profitable mode of farming, which could not be done without the command of capital. So to meet the difficulties of this case, I propose the following scheme. That the Legislature of the Province or Provinces or State, pledge the revenues of the country, as sesurity for the purpose of borrowing a certain sum of money to be loaned to the farmers for the purpose of under-draining their farms, that the whole amount should be paid to them, as the work proceedes—or otherwise the scheme would be useless, as the object is not merely to furnish them with means to drain, but all sufficient capital to develop the resources of the land, by cultivation and manuring after drainage. It is proposed that the work shall be performed by the farmer's own family, if advisable, which work shall be paid for, at rates specified by the Government Drainage Commissioner, who would also lay out the work and inspect it before granting certificates. Assuming that the land could be drained at distances forty feet apart, it would take one thousand tiles, and sixty rods of ditching, so that the account would stand thus: One thousand one inch tiles at $9, 1000 collars $5, freight $5, sixty rods of four feet ditching at 30 cents, $18. Laying tiles 5 cents, $3, hauling per acre tiles from wharf or tile yard, $2, total Forty-two Dollars per acre. The whole of this money could be earned by the farmer's family and employees, with the exception of nineteen or twenty dollars, so that he would have enough in hand to plough subsoil, and dress this acre of land with half a ton of artificial man-

ures, ensuring a crop of the value of from fifty to one hundred dollars. There would be a risk that the money would not be devoted to this purpose, and this danger could only be overted in the following way: By making a special agreement with the holders of the mortgages that in case of foreclosure they would allow their money to remain on the farm, so that the Government after that would hold all the right, and interest, as security till the drainage was paid for. My own experience has shown me that this would be quite sufficient, as the Farmers would make the most strenuous efforts to divert the Government money into its proper channel, knowing well that he could easily be supplanted in his position, and the farmer would be so situated that but little capital would be required to work it.

When I spoke of this subject some few years ago, many have objected on account of the want of security to the public. They say the farmers would get their land drained for nothing I cannot imagine a better security being offered under these circumstances. Our farmers, although not very progressive, are sufficiently acquainted with the advantages of drainage, not to let a chance like this slip, especially where they would have but little to invest, and could continue the process of draining under Government or State patranage, with the certainty of ultimately acquiring a valuable property.

Should an occurance like this take place, there would be ten applications from responsible persons to every vacation.

But it is not my object to point out how easily farmers can be turned out of house and home, but to assist those who have now a hard struggle to hold them. But it is necessary that these difficulties should be pointed out, or the means to overcome them could not be provided for. Special agreements should be made with the mortgagee, and a special act passed to meet the case. Should the holder of the mortgage not come to the terms, agreeing to leave his money on mortgage, in case of foreclosure, also not agreeing to the terms of the act which should make the drainage a charge on the farm, under any circumstance, then he should be passed over, and no other application, with reference to draining that farm, be entertained, until the whole money had been loaned, and a new list opened, and he would then have the pleasure of seeing properties improved at the cost of others, while his own remaided water-logged and unproductive.

Perhaps it might be advisable to adopt compulsory measures, as are done in England, where private selfishness is not allowed to remain long, as a stumbling block to public good.

The worker or occupier of the soil would be benefitted according to the extent to which he was able and willing to improve, which would depend a good deal on the strenght of his family, but the lesson tought by the one acre, ought to be of greater value than the actual increased produce itself, and our farmers would be sure to profit by it.

I am not sure but that it would be better at once to pay the

farmer in good superphosphate, to be applied to the land, although, I do not like the idea of a government being too paternal, and besides it would be trusting too little to the farmers' honesty and judgment. With regard to the best plan of dealing with the second case, and inducing small capitalists to purchase and work the already worn out farms, it would be by merely applying the principles enunciated in this work, in practice, and through the aid of loan societies. The method of working these societies, several of which are at work in the Provinces, appears to be, that money is loaned on real estate to be repaid principal and interest by semi-annual instalments, extending over twenty years. Now, a farmer, by borrowing money from them, would have all the advantages of the English system: his capital would be free to work upon, without the disagreeable restraint and sense of dependence, his landlords would be too numerous to be able to make themselves obnoxious, and would be more imaginary than real; besides with some societies where certificates are issued on subscription, he would be partially his own landlord, if that would be any satisfaction to him, for the whole tendency of the arrangement is such that in a given number of years he would be the owner of a highly improved, valuable, unencumbered property, to which end every year would bring him nearer, both as regards time and money.

It would be desirable that the whole of the purchase money should be borrowed, so as not to trench upon the working capital. In case the security should not be deemed sufficient, I would propose that a guarantee should be given that a certain amount of drainage be carried on and finished in a given time, to increase the value of the property up to the amount specified. This could be managed by an agreement between the government and the companies loaning the purchase money. The drainage would be carried out in the way specified.

It would not be advisable to encourage a scheme of this kind unless the farmer was prepared to show that he had the command of a certain amount of capital himself, I should say five pounds per acre at least for the land he intended to work.

It may be asked, why should the government give assistance in this way only through the medium of drainage? And also, why not borrow the drainage money from the loan societies in addition to the purchase money? The answer to the first question would be, that looking at the various Provinces or States, as large landed estates, of which the governments have the charge, that in assisting in work of this kind, they are only improving the property under their charge, for the indirect benefit of the public, and that the drainage is a permanent benefit that remains after the proprietors have removed from the soil, besides that loan companies in new countries will not lend money for what is not actually in existance, and would not go to the trouble and expense of seeing the work properly carried out, as they have no indirect benefit in the matter.

It should be borne in mind that the government are not request-

ed to place a fresh burden on the people to be repaid by taxation, as is generally the case with our public works, but merely to become security for the money that is to be paid by instalments extending over a period of say twenty years, although in England they sometimes make fifty years the limit of time for repayment.

It will be seen from the working of this system, that a comparatively small sum borrowed would place a constant fund in the hands of the government for this purpose, so that one hundred thousand dollars would give an annual loan of ten thousand dollars, which would be the receipts of the instalments at five per cent.

The cost to the farmer would be according to the above estimate, exactly three dollars per acre, paying both principal and interest.

Now it is for them to judge whether the advantages to be gained are equal to the expenditures or not.

I believe drainage to be the foundation of all good farming, and perhaps no where more necessary than in the North American Provinces or States. The effect of drainage on a large scale would no doubt ameliorate the climate, and make the Springs much earlier, but I do not wish to make any further remarks on the subject, as I have written especially upon it.

Before such a scheme could be carried out, it would be well to have meetings of the most advanced farmers, and the subject in all its bearings fully discussed. For my part I have been led to serious reflection on the subject, by the peculiar way in which I have been placed myself.

It seems to me to be an anomaly, that a person can be brought to the very verge of ruin, while conducting his business on the most approved method, and a lengthened conversation with a Scotch gentleman, who had experience in both English and American farming, led me to the considerations of these matters in their different bearings, and the total conclusion I have arrived at is, that of all the reasons assigned for unprofitable farming, or rather our being unable to make farming profitable, the only one that has really operated against us in any considerable degree, has been the being compelled to use our capital for other than its legitimate purpose. We are all more land proprietors than tenants, and consequently we only get landlords interest.

Hardly a day passes but what I get additional evidence of the wants of country in this way, "How is my old friend, so and so?" I asked the other day. "Oh, very well, I was never more impressed with the value of drainage, than when I was up at his place last spring, but I'm afraid, poor fellow, he has gone beyond his means." And so it goes on. A farmer cannot afford to lay out ten pounds an acre in drainage, and yet he cannot do without it, at three times the price. He can pay the interest on the money required to drain over and over again, provided he has capital enough left to follow up a system, but he is compelled to lock up money that he requires, and it is not devoted to his proper business, which is converting manure into produce. He is assuming the position of a landlord. He is laying the track for a profitable traffic, which

must pass into the hands of others, who will reap the benefit of his industry. Surely this is a case for Legislation in Nova Scotia, or any of the other Provinces or States for that matter.

We are not, by any means, in that position of prosperity, that the public can stand quietly by and see efforts like these, that may be of such importance, and as commencements in the right direction smothered in the outset, we profess to take great interest in the improvement of agriculture, and various sums of money have been devoted to this purpose, and yet it cannot be said that one single step in advance has been made; not a single obstruction removed, that stands in the way of progress towards the main end in view for the importation of stock for the improvement of the land, is only assisting a branch or appendage of agriculture, and is a question of money, not skill except to the originators of the system.

It is no wonder that a member of the Legislature (I refer to Nova Scotia) complained that so little result had followed from the expenditure of so much time, and public money.

It seems to me neither fair nor right that while the public are willing and anxious to pay for knowledge acquired in this branch of industry, the real burden of developing it is thrown entirely on private individuals, to whom the slightest mistakes are fatal, and the consequences are, that schemes that in themselves are valuable and necessary are nipped in the bud for want of capital to fully develope, and act as warning instead of encouragement.

While willing to give every credit to the Secretary and members of the Agricultural Board, I cannot but express the opinion that other means than those taken must be used before agriculture can hold that position that is absolutely necessary.

The articles that occasionally appear in Journals of Agriculture, recommending farmers to abandon the present systems, are generally founded on a knowledge of the principals of Scientific farming, but are comparatively useless, because they are not practical.

I am sure the value of roots as a substitute for hay, for winter feeding, has been shown to the farmers ever since the days of Agricola, and entirely without effect, because the change involves a large outlay of capital, for reasons which have been heretofore explained, and no system has lately ever been promulgated and brought forward to relieve this want.

It appears to me to be useless to advise the farmers to adopt potatoes in rotation, instead of turnips, as done in a late Journal, when they have not even got into a turnip rotation and cannot; equally unavailing is it to devote all our means and energies to the production of thorough-bred stock, when we have not as yet perfected any system that can produce, economically, the food necessary for these stock to fulfill their office, which is to turn produce into meat with the least waste or loss, also to arrive at maturity ready for the butcher early.

It is desirable to have thorough-bred stock on a farm in the same way that it would be to have good locomotives on a railway that

would economise wear and tear and fuel, but no one would expect them to build up the trafic. If the constant importation of thoroughbred stock was all that would be necessary to make agriculture a thriving and prosperous business, then our task would indeed be easy, thanks to the skill and enterprise of various breeders. But so far from that being the case, we have a work of great magnitude before us, and one that cannot be accomplished by the easy path made by the application of public funds alone, no matter how plentiful they may be, but by a combination of clear head work, energy, and determination.

DRAINAGE.

CHAPTER I.

INSTRUCTIONS ONLY FOR PRACTICAL FARMERS. TO ASCERTAIN WHAT LANDS REQUIRE DRAINING. INDICATIONS OF AN OPEN SOIL. DIFFERENCE OF OPINION AS TO DEPTH OF DRAINS AND DISTANCES APART. DRAINS SHOULD BE CUT VERTICALLY, AGAINST THE HILL SLOPE. DRAINS IN OLD TIMES NOT DEEP ENOUGH FEW DARE INVEST IN FARMING WITHOUT DRAINAGE. QUOTATIONS FROM STREVENS AND FROM AMERICAN AUTHORS. DRAINAGE SHOULD BE CONNECTED WITH GOOD FARMING. AGRICULTURE COMPARED TO MANUFACTURES. PRACTICAL DRAINAGE—PROTECT THE OUTLETS. LAYING THE MAIN DRAIN. NO FARMER SHOULD BE HIS OWN ENGINEER. MEANS TO SECURE A PERFECT ALLENIATION. THEORY SHOWS THAT DISTANCES AND DEPTHS ARE DEPENDENT ON ONE ANOTHER. WHY FOUR FEET DRAINS ARE A GOOD DEPTH. NO ECONOMY IN SHALLOW DRAINING. THE BEST DRAINS FOR MINORS. COMPARISONS OF COST. TILES TO BE ARTIFICIALLY CONNECTED.

Any one wishing to thoroughly post themselves in the subject of draining, must look further than through the pages of this little book. For the writer has no pretention whatever to so thorough a knowledge ot the subject, as would enable him to place himself side by side with the different writers on this subject, and, in fact, all the information now given comes, so to speak, second handed from the different authorities, but has been proved, applied and carried out in practice.

In the preceding pages I have not sufficiently gone into details, perhaps, to please those who may wish to carry out drainage on their own farms, so that in the following, I hope to remedy the defect. As I presume that few would trouble themselves with this subject merely for the purpose of acquiring a certain amount of scientific knowledge, but would rather be governed by the prospective hope of profit.

I will, in the first place, endeavor to point out what lands require drainage, and what advantage is to be gained by draining them.

Some writers have gone so far as to assert that all lands worth cultivating require drainage, but this is going too far. There are certain rules by which any person, who has had experience, could readily ascertain at almost any season of the year, except winter, and in almost any state that the land may be in, whether this improvement was requisite or not. We will give a few indications of an impervious wet sub-soil, that have come under our own notice repeatedly. First, the growth of aquatic plants and grasses in places where the inclination of the land shows that water cannot possibly have lodged there permanently. Many may remark that is easy enough for any one to know, this is true, but how many reasonably apply this information, or if so, why do we see surface ditches constantly dug to let off the surplus water, that is supposed to produce these plants, when they are located in a position that no surface water could possibly stand near them?

I have pointed these facts out repeatedly to men when engaged in ditching, but without receiving any satisfactory answer. The signs of a wet sub-soil are most plainly indicated after land has been ploughed, and particularly in the spring, when viewed from an opposite hill. In grass land the turf should be fine and springy in drained land, while in that which has an impervious sub-soil, it is always either spongy in wet weather, and hard summer. In working undrained clay land, the difference can soon be detected by an experienced eye; the furrow slice, when turned over by the plough, is hard and stiff (even if the land is in perfectly good order for cultivation at the time—that is if land undrained can ever be said to be in a state fit for cultivation—but had been watersogged all winter) and easily bear the weight of the body when stepped on, instead of crumbling to pieces, the harrows make little impression, and catch and go in a zigzag manner, instead of swinging along easily; when the roller is passed over the ground, the lumps are only pressed into the earth, instead of becoming finely disintegrated, and the roots of weeds and grasses, instead of entirely separating from the earth, are broken off and remain to grow afresh, thus rendering the land much harder to clean.

It is not often that a farmer is inconvenienced in the summer time by his land being undrained, beyond what mischief has already been done by the water not having been drawn off in the fall. But I recollect a few occasions of this kind. Once when we could hardly get on the land, on account of its wet state, to top-dress a crop of mangolds with artificial manures, and twice, when

the horses almost got mired, when hauling in the grain and the hay. A friend of mine tells me that it is a common saying in Scotland, that on well drained clay soil you should be able to walk across a fallow field in your stocking feet, without getting wet, twenty-four hours after a rain storm, that is if there has been any sun to dry the surface.

If you dig a two or three feet ditch, and water gathers in it, the land requires drainage, and as a general rule, the more rapidly, the further the drains can be placed apart, as this is an indication of an open soil.

To trace back the origin of drainage is beyond my province, but it is said to have existed in the time of the Romans. Perhaps Elkington was almost the first man who was actually employed as a draining engineer in England, although his system, or the system that he owed his celebrity to, was different from that now generally in practice. The Elkington system of drainage is generally supposed to apply to the method of tapping water in a lower sub-strata by means of boring, when either rises to the surface, and is conducted off by an ordinary drain, or is got rid of by being vented into a lower and open sub strata. This system might apply in some cases where our plaster formation exists, and where no other outlet could be got. Among the old advocates of drainage, the greatest difference of opinion appeared to exist as to the depth to which it was advisable to drain, many advocating drains of eighteen inches deep and from ten to fifteen feet apart, others from three to four feet deep and thirty to forty feet apart; and perhaps this question is not definitely settled yet when certain soils are concerned

Also among other systems advocated, which need not be fully described here, as they have nearly all been rejected, was the plan of draining diagonally across the inclination of the slope of the ground; but reason and experience soon showed this to be a mistake, as rain falling on the centre of a ridge naturally had a tendency to follow that inclination, so that as soon as the sloping land fell below the level of the bottom of the drain, the water would have a tendency to seek the level of the lower drain, instead of the one nearest to it. So that if the drains were forty feet apart, and the ground sloped one foot in five, then in twenty feet, or midway between the drains, the level of the ground would be on exactly the same level as the bottom of the ditch. Consequently it could have no influence. These reasons led drainers to come to the conclusion that drains should be cut directly against the slope of the hill.

From want of the general knowledge of the principles of agriculture, our ancestors appear to almost universally have made the mistake of draining too near the surface, very likely they had what is the prevalent notion in Nova Scotia, that it was only the surface water that it was necessary to get rid of, and that if the drains were put deep enough to avoid being disturbed by the plough it was quite sufficient. Thousands of acres were drained in this way in Great Britain, and although the land was temporarily benefitted, and could be worked easier, and sooner in wet weather, still in dry

weather the crops apparently suffered, and further investigation led to the belief that insufficient depth of drainage and cultivation was the principal cause, so that as new work of this kind was being undertaken, the depth of cutting of the drains was gradually increased, till at last scientific men begun to recognize the fact, that certain laws were to be obeyed, by which the depths and distances could be properly regulated, so that the work would give the utmost satisfaction.

As soon as this was the case, shallow draining became a thing of the past, not only on all new work projected, but the old drains had to be taken up and renovated and improved.

Col. French says, that in Scotland alone, not less than 10,000 miles of shallow drains were laid before it was found that the depth was insufficient.

The fact of the enormous extention of the drainage system in Great Britain, is a proof that the benefit gained is considered to be consummate with the expense. So much importance was attached to the desirability of this work being carried on extensively, that the Government were authorized to advance money to land proprietors for this purpose.

It may safely be said that it is now considered the foundation of all good and profitable farming, and that few farmers would be found reckless enough to invest capital in farming on undrained soil.

Mr Mechi speaks of our neighbor who quitted his farm after a few years trial, a ruined man, and he ascribes his losses entirely to want of draining.

I will add an extract from Stevens' book on the farm, with the remark that all these facts have come personally under my own observation.

"The existance of moisture in the soil being easily detected by injurious effects on the crops. The advantages derived from draining, are also indicated by its good effects on them. On drained land the straw of white crops shoots up with a vigorous beard, strong, long, and so stiff as not to be easily lodged, the grain is plump, bright colored, and thin skinned. The crop ripens uniformly, is bulky, prolific, more quickly won for stacking, in harvest, more easily thrashed. winnowed and cleaned. The straw also makes better food for live stock. Clover grows rank, long and juicy, and the flowers large and of bright color. The hay wons easily and weighs heavily for its bulk. Pasture grasses stool out in every direction, covering the ground with a thick sward, and producing milk and meat of the finest quality. Turnips become large and plump as if fully grown, juicy, and with a smooth and oily skin. Potatoes push out long and strong stems, with large tubers, having skins easily pealed off, and their substance mealy when boiled. Live stock of every kind thrive, evince good temper, are easily fattened, and of fine quality. Land is less occupied with weeds, the increased luxuriance of all the crops checking their growth. Summer fallow is more easily cleaned, and much less

labor is required to put the land in order for manure and seed, and all sorts of manures incorporate more quickly with the soil.

Thorough drained land is easily worked with all the common implements. Being all alike, its texture becomes equal and in consequence, the plow passes through it with uniform freedom, and moving in a freer soil, it is able to raise a deeper furrow slice, which, on its part, though heavy, crumbles down and yields to the pressure and friction of the mould board, into friable mellow, rich-looking mould. The harrows, instead of being held back at times, and starting forward and oscillating sideways, swim along, raking the soil into a smooth surface, and entirely obliterating the horses' footmarks. The roller compresses, and leaves the soil even and smooth, but the part below in a mellow state for the roots of plants to extend in.

I now make a few quotations from American authors, as to the urgent necessity of drainage:

Emerson, in an address at Concord, Mass., thus alludes to the subject:—By drainage we have gone to the sub-soil and we have a Concord under a Concord, a Middlesex under a Middlesex, and a basement story of Massachusetts more valuable than the heaped up structure. Tiles are political economists, they are so many young Americans announcing a better era, a day of fat things.

John J. Klippart, Esq. says, the agriculture of Ohio can make no further progress until a good system of underdrainage has been adopted.

Another writer says, one of two things must be done by us here, clay predominates in our soil, and we must underdrain our land or sell and move west.

Prof Mapes says, I do not believe that farming can be pursued with profit without it.

To these I will add a few remarks of my own. I cannot speak of drainage in the enthusiastic manner that Emerson does, for experience has told me that the comparisons he uses do not always hold good, unless you happen to have a sub-soil of superior fertility to the top soil, which rarely happens.

I believe many years ago, a great many farmers were misled in Scotland, by following the example of a nobleman, who had mixed his sub-soil with the top soil, to the manifest advantage of both. His neighbors, being disappointed, endeavored to ascertain the reason, when analysis showed that his subsoil was actually richer in certain ingredients than the top soil, while theirs was the reverse.

I never tried the experiment of mixing any two soils together by trench ploughing, although the ordinary sub-soil plough brings up a small quantity, and I confess I should be very doubtful of the result, judging from the appearance of the spots where we have pitted our roots. Although, as regards the benefits to be derived from draining, as stated by Stevens, are all perfectly true, still the farmers of this country should remember, that it is only in connection with good cultivation and manuring that these results are to be obtained.

The better farmer a man is the more he will be benefitted by drainage. I know that the majority of farmers in this district are unable to carry out rotation at all for want of drainage, or to speak plainer, they are compelled to cultivate the same land in roots year after year, because it happens to be dry.

Consequently they take three inferior hay crops, worth from ten to twenty dollars per acre, in place of two good grain and one clover crop, which ought to be worth nearly three times that price, while it is doubtful whether the root crop is at all benefitted by being cultivated on the same land year after year.

It may be safely assumed that a poor farmer, or one who cares about nothing but cutting and curing hay for the market, will hardly go to the trouble and expense of drainage, as although it would undoubtedly be advisable and profitable. Still the urgency is not so great as on land for cultivation.

The more a man looks upon land as what I believe it is, or rather is getting to be, a receptical for manure to be turned into produce, or as the New Jersey man remarked, something to keep the plant upright while the manure nourished it, the more desirous he will be for drainage. He will want to have his manufacture in perfect order, so that the finished article can be returned to him for sale, with as little delay and expense as possible, and as little waste of the raw material.

I no not mean to imply that all lands in this part of North America are in this state of infertility, but I most certainly believe that the farmer who makes this his doctrine will be most likely to succeed, and less liable to disappointment.

If there is any unexhausted fertility to be found, it will, most likely, be on the wettest, undrained soil.

I have dwelt for some length on this latter part of the subject, because it is absolutely necessary that a farmer should understand his own mind before he becomes en...gled in an unprofitable investment. Digging drains must not be looked upon as digging for gold, but more as the laying a tramway for the profits of traffic.

There would be no advantage gained, that I can see, by giving examples of the cost and profits of drainage, as taken from English works, as the cost of labor, produce, &c., all are so different, and everything is so systematized there, that no information would be gained thereby, so that details of my own experience would be more valuable.

The first thing in commencing drainage, is to find a proper outlet. It having been decided that the drains are to be cut directly against the slope of the hill, the outlet will be somewhere at the lowest part of the field to be drained, or at the lowest level. Should the sloping field terminate in an abrupt bank adjoining a road, or otherwise, then each drain can be vented, independently without the construction of a main drain at all. The only objection there can possibly be to this arrangement is that you have a number of openings to protect instead of one, for although it may appear to be an imaginary trouble. I have seen drains stopped in two instances

by frogs building their nests in them. They cut what appears to be light brush or sticks exactly the length of the tile, and thus completely dams back the water, and unfortunately they often travel a considerable distance up the drain before commencing operations. A small wooden trunk, with a grating over the end, is the best protection against this nuisance.

On account of the main drain often being run at right angles to the slope of the hill, the fall is generally very small compared with that of others, but it can be increased considerably, by placing the upper end up the slope, but not so much as to leave the lower part of the field undrained. But sometimes it is advisable even to do this, and drain the lower part independently, venting into the main drain at a lower level, thus the permanency of the whole work is not endangered for the sake of a small piece.

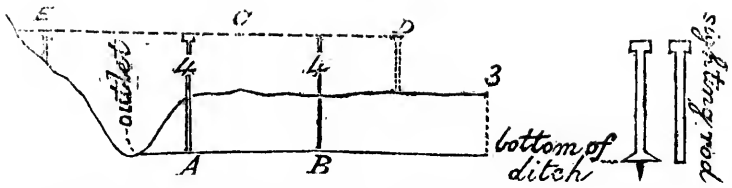
The inclination to be given to the main drain depends somewhat on the size of tile used, for if it is only of a small bore, the greater the fall, the quicker the water gets away. If a pipe sufficiently large is used, looking only to the safety of the work, I believe that main drains can be laid with little or no inclination, with perfect safety; but then it must be remembered that the least obstruction at the outlet causes the water in the whole drain to stagnate, so that should there be any matter in suspension, it is very likely to be deposited.

Another great obstruction to drains with small fall, is that you are liable not to get the exact line of inclination you bargain for. Unskillful workmen may dig portions of the drain out till it is even below the level of the outlet, when it is liable to become obstructed and the whole connection is broken.

The fact is that no farmer, no matter how well he may be acquainted with the theoretical principals of drainage, should lay out his own drains, if he can possibly employ an engineer, or anyone used to giving levels and sections.

People, in a new country especially, are very unwilling to employ engineers on any work that they can possibly do themselves. Whereas, even if the work is finished, and answers satisfactorily without such assistance, it may be looked upon as a matter of certainty, that an engineer would have saved his salary ten times over by laying out the work in a proper manner, besides insuring its success.

I have mentioned previously the plan I adopted to insure the accurate alleniation ot all the bottoms of the principal drains, and I now explain it more carefully. A line of levels are run and a section made which shows the inclination and surface of the ground, as follows:



The rods A and B are placed in the ground to the depth shown on the section, being four feet at A and B. Then the line C is parallel to A B, or to the finished bottom of the ditch. A small rod D can be put in the line of horozontal range for convenience or another at E, so that a rod exactly the length of A and B minus, the shoeing, held up in any of these ranges will exactly, by its bottom, indicate how deep to dig. These are what are generally called boneing rods, and are used to inspect work after it has been finished.

Col. French very properly says, "I object to the use of these rods, for they require two to hold them, and they are no guide to the men when working." But by my plan, for I certainly originated it, these objections are done away with, and it is not as tedious as the method described by Colonel French, and his plan presupposes quite as much knowledge of levelling as mine does.

The size of tile for the main drain is a matter of importance, as it should be large enough to convey the water away as fast as it receives it.

As a rule, people, judging from the flow of the water in a broad open shallow ditch, imagine that a very much larger pipe is required for this purpose than is absolutely necessary. A three inch pipe contains nine times the area of orifice of a one inch pipe. So that even if the pipes were full, and it takes a long drain indeed before this becomes the case, a three inch main pipe would serve for an outlet for nine drains which, at forty feet apart, would give a total breadth of 360 feet, and in this short distance, I do not think it would matter very much if the inclination of the main drain was small, as the velocity of the water would be increased by the influx of the minor drains, provided that the connections were properly made, so that the current was not checked.

The next point to decide is the distance apart that the drains should be laid, and farmers will be apt to make a compromise between expense and a proper execution of the work.

It is necessary here to enter into theoretical reasoning on the subject. All water, as we know, has a tendency to seek the lowest level, and where no obstructions or hindrances occur, it is only a question of size of outlet, as to how long it will take to drain a certain area, but when it falls on and saturates the soil, it has the friction to contend with in its passage to an outlet, the extent of which depends on the consistancy and character of the soil, loose sand and gravel offering the least obstruction, and stiff clay the greatest, and other soils in proportion to their constituents The tendency in water to seek the lowest level, is by the force of gravi-

tation, and the steeper the line of gravitation, the more power it has to overcome friction. It is necessary that the farmer should thoroughly understand this as, if in draining he de does not know what he is aiming to accomplish, he cannot possibly expect to be satisfied by the result.

To make myself thoroughly understood, I will offer the following illustration:

Suppose you place your drain four feet deep for the purpose of drying half a ridge twenty feet wide, that the soil is of that consistancy that the water will not pass into the drain at a less inclination than three feet in twenty, then you would only have one foot of dry land in the centre of the ridge, so that if you required two feet clear of drained land, it would be requisite to bring the line of inclination to a lower parallel by either increasing the depth of the drain, or placing them closer together.

I have repeatedly, in approaching an old drain, come across this table of stagnant water, which gets nearer the surface the further you recede from the drain. But to what extent depth can be increased for the purpose of decreasing the number of drains is still an open question, particularly when relating to clay soil.

It can easily be seen from the foregoing remarks that the distances at which drains can be laid apart, and the depths, are entirely dependent on one another.

There are two or three circumstances which in this country, enable us to fix on the approximate depth, with some degree of certainty. The first is the great severity of the frost, which makes a three foot drain quite unsafe. I know that some have been laid at that depth, but there is not enough gain for the risk incurred. They may run a number of years, and yet in a very delapidated state. I myself have had four foot drains frozen up in places, and yet, near the outlets, where they have not been covered with more than two and a half feet of earth, they have remained perfectly safe. But this is no doubt owing to the fact that the large flow of water coming from the hill above, has always been of sufficient temperature to keep them clear.

In the second place, the great cost of tiles, and the expense of carriage and labour, makes it advisable to increase the distance of the drains, wherever it can be safely done; so that I have no hesitation in recommending four feet as the depth that it is generally advisable to drain to, though in some cases, and in some soils, and where tiles are very expensive, I do not see why the depth should not be greatly increased and the width in proportion.

Having assumed that four feet is the most desirable depth, the question is, how far to put the drains apart, so that we may have a depth of eighteen inches of dry land in the centre of the ridge.

To refer to what we were speaking of before, if the line of inclination to overcome friction is one foot in about seven, or three in twenty, if we substituted a three foot drain for a four foot one, the water table would run out at the surface, and seven feet from the centre there would only be one foot of dry land, so that the two

three foot drains could only be depended on to dry a twenty-eight foot ridge, so that by increasing the depth to four feet, we could afford to put them about one third further apart.

Nothing but experience will enable any one to hit, with a nicety, on the distance apart that can be drained with safety.

We do not know of any better plan that can be adopted than the one practiced by me, and that is by running experimental drains, and sinking test holes, but I think a few feet farther may be allowed than the test-holes would indicate to be safe, as drains are one of the few things that become more effective the older they get. This is known to be the case in England,and it would naturally be more so in America, where the frost piercing into the ground, as the water makes way for it, pulverizes the soil and makes it less retentive.

What are generally called medium clays can be safely drained at distances of from thirty-six to forty feet apart.

No one should ever think of partially draining their land, as some of the greatest benefits to be derived from this investment would be entirely lost. You could not cultivate a field in sections, while waiting for the wet portion to dry.

Having decided upon the depth and distances that the drains are to be placed apart, the next question is, as to what sized tile it is preferable to use.

I have explained, that in my drainage, I have used three different kinds, the horse shoe, ordinary two-inch tile, with flat bottom and round top, and the one-inch tile with a collar.

In referring to works on drainage, I find that some engineers consider that an inch tile without a collar, is entirely too small, in which opinion I agree. Not but what the bore is sufficient for ordinary minors, but because there is too little to come and go on in connecting them. the least deviation in either tile would break the connection, and when we come to think, that we have a joint in every foot, it is not improbable but that this might happen. The average bore, or capacity to carry off water, or matter deposited, of a two-inch tile without a collar, would not, in all probability, be more than that of an inch tile with a collar. While in the latter case, the security of the drain will be much greater.

When boards are laid under the tiles the bottom of the drain is secured, and this is where disconnection is most likely to occur. But there is no positive certainty of the tiles not being displaced when being filled over, and three open joints are exposed, which are completely covered with collars.

The comparative cost would approximate nearly to the following figures: One thousand two-inch tiles, which would be enough for one acre, when laid forty feet apart, would cost ten dollars; three hundred and thirty feet of boards, at eight dollars per thousand, would be about three dollars, making a total of thirteen dollars. The other estimate would be, one thousand feet of one-inch tiles, nine dollars; one thousand collars, I should think about five dollars, it appears to me that is what I paid, it certainly is enough ; freight

on one thousand collars, about two dollars—I cannot name the exact sum as I do not know where they are supposed to come from, but it is necessary that some item should be entered for this part of the expense. The haulage from the wharf to the farm, I make no charge for, as the difference between the moving the one and two-inch tiles would about make up for the collars. There would be no difference in the expence of laying them either, as there is generally a considerable delay in fitting the joints of pipes without them.

According to these estimates, the cost of material for the drains complete, stands as follows: Two-inch pipes, thirteen dollars per acre; one-inch, with collar, sixteen dollars. Now the question is, whether it is worth while to risk an inferior drain for the sake of so few dollars per acre, for the open pipes certainty are an inferior drain to the other, although I do not think that much danger of injury to drains need be anticipated if the perfect alienation of the bottom is secured. True, earth may sift in through the opening in the sides and in the top, but according to my experience, it is a thing that rarely happens, if the proper precautions, hereafter detailed, are taken.

I have said nothing in favor of horse shoe tiles, because I look upon them as things of the past, although, even now, preferred by some old drainers, but perhaps for no better reason that can be given by some old sportsmen, who profess to prefer flint guns to percussion ones.

With regard to a drain finished with tiles without collars, I believe they could be safely laid, in a clean cutting clay bottom, without any great risk, but the bore should not be less than two inches in diameter.

CHAPTER II.

DIFFICULTIES IN COMMENCING WORK. TOOLS REQUIRED. JOINTS WELL SECURED, NO RISK IN FILLING IN. TILES IN FILTY LAND. LAYING TILES. BACK FURROWING OVER DRAIN. OBSTRUCTIONS IN DRAIN. RECTIFYING OBSTRUCTIONS. WATER LINE RISES TO BOTTOM OF DRAIN. DRAINAGE PRESERVES LAND FROM DROUGHT.

Having made all preliminary preparations, now comes the most difficult matter of all to deal with, that is, to get men able and willing to take your drains at a reasonable price, and do them in a satisfactory manner.

I believe the best plan is to abolish days work entirely, so that the laborer has an interest in carrying out the work skillfully.

Few novices can be made to believe that a deep drain can be dug with the removal of so little earth as is really the case, and their prejudice will not allow them to give the matter a fair trial.

The easiest, and most straightforward way, is perhaps in the commencement to dig a few drains by days work, after furnishing the proper tools, and laying the work off yourself.

It is also a good plan to make a wooden frame, the exact size and shape of the drain, which pattern they should be compelled to follow. the frame would be of about the following dimentions: For a four foot ditch, width at top, two feet, sloping down to four inches in the bottom, but this should be the maximum size, as it is quite possible to get down four feet with less excavation.

The workmen will soon find out that the amount of wages they earn depends more upon the number of cubic feet they throw out of the drain than on the facilities they have for working, for in the part of the ditch in which they are most inconvenienced for want of room, the excavation has become very small.

The only extra tools that are not made in the country, unless expressly to order, that I found is requisite to get, are a set of bottoming tools, consisting of a spade of a semi-circular shape, and tapering to about three inches at the bottom, with a tread on the shoulder, for they are made so narrow that a workman has hardly room to bring his foot down with force on the spade itself to drive it into the earth. With this implement the earth is taken out from one foot to fifteen inches below where the workman stands; and then a narrow circular scoop attached to a long handle is drawn along the bottom of the ditch, to collect what are tecknically called the crumbs.

Col. French appears to be skeptical as to whether the bottom of deep drains can be excavated this way, but I can assure the reader that there is not the least difficulty, as this method was universally adopted on this farm, except for main drains.

Fortunately an English gentleman who lived in the neighborhood had imported some proper draining spades, so that we had several made after these patterns, which, although they answered in a certain way, were not favorites with the workmen, as the little English spade was. The men complained that the others would not free themselves from the earth as the latter would.

My men used the ordidary digging spade and shovel for the first half of the ditch, then the same spade and an English navvy shovel with a few inches cut from each side finished the next foot, or until it was necessary to use the bottoming tools.

The price I universally paid was thirty cents a rod for digging and filling, for minors, and forty cents for main drains.

The laying the tiles can either be done by contract or by days work, and is worth about five cents per rod, provided that a small portion of the earth is returned. Main pipes are always layed by hand, the workmen taking them from the bank where they have been previously deposited.

Some drainers insist upon having the first spitting of earth deposited on one side of the ditch, so that it may cover the tile, but this is only necessary when the sub-soil consists of a hard stiff soil, and I doubt whether the practice is advisable any way, as the uniformity of the texture of the soil is thereby destroyed, and the hard baked clay allowes the water to have too free access to the tiles from above.

I have tried many of the plans recommended by drainers for filling over tiles, but gradually abandoned them all. Tan-bark, I found quite as liable to choke the drains as silt. When the joints are at all open, a sod laid inversely is advisable, but when collars are used it is unnecessary.

It depends on circumstances as to whether it is advisable to

commence at the main drain and lay up the slope, or the reberse. In the former case, the bottom of the drain is disturbed in the operation of laying, and the tiles below are liable to become choked.

I found from experience that it was better to adopt the latter method, and commence at the highest end of the drain, you are then sure of your work, as far as you go, the safety of which is indicated by the clear stream of running water.

When the minor drains vent into a main, it is prudent to keep the connecting place tightly closed by sods, &c.

A great deal of water will accumulate at the lowest level, which must be pumped out before the connection can be made, this plan no doubt involves a great deal of trouble, but it is better by far than having to take your main drains up on account of their becoming choked with slurry.

Where you have a very bad minor drain venting into a main, it is sometimes better to stop your cutting some distance from the main drain, and then vent on to the surface, or across the main drain, then it can be completed all but forming the connection, which can be done at almost any time, either by taking the opportunity when the weather is dry or otherwise, as the main drain will have dried the land in the vacinity.

I have adopted this plan in bad weather, and in digging bad drains—I mean those that are constantly caving in—with great success.

I have hitherto said nothing about joint tiles, simply for the reason that I never saw any. I tried to get the manufacturer of my tiles to make some, but was never supplied with them, so I was compelled to improvise joints out of what material we had, and which has hitherto answered the purpose, but it was not by any means a satisfactory way of doing work in this kind.

Should it be desirable to lay the tiles without standing in the ditch, it is quite possible to do so, in fact, some of them are cut so narrow that the work can be accomplished in no other way. A simple tool can be made by any carpenter to answer the purpose. It consists of a long wooden handle with a small square knob or or boss on the end, and a round piece of iron about fifteen inches long inverted into it at right angles, the tile is placed on the iron and lowered into its position, when a few taps from the layer gives it an even baring. When collars are used, they are placed on the iron first, and the tile inserted into it (the collar) till about half way through, they are then lowered into position in the ditch, and the free end of the tile is inserted into the collar of the tile previously laid; the iron is then withdrawn carefully, and the end of the pole applied to ascertain that the tile has not been drawn out of the collar. The drain being now completed, there is nothing further to be done than to replace the filling.

As I have before stated, I have found no better plan than doing this work by the hand, but on account of what engineers call subsidence, the earth taken out will not refill the drain, consequently

as its security in a great measure depends on its being protected this way, other means have to be taken to bring it to the proper level. This is done by back furrowing with the plow; so that it requires some skill to lay a field off properly after it has been drained, that the drains shall be in the centre of every ridge.

Writers on the subject of drainage generally recommend that an accurate plan should be kept, showing the whole system on paper, that in case of a drain failing, its position can always be ascertained by scale and measurement, and any defect remedied.

Although this would certainly by a systematic way, I cannot see that it is absolutely necessary. Few farmers would scale off with sufficient accuracy to determine the exact position of a drain, so as to dig down to it with confidence. While should there be any stoppage or derangement of the tiles, the flow of water would soon indicate the place affected.

Should anything of this kind occur, a crowbar should be driven down above the drain, when the point immediately between the wet and dry sub-soil will indicate the point of obstruction, provided the land below has not become too much saturated with the water from the tile drain, if so, the bar must be driven down nearly to the depth of the tile, when a small spring, caused by the force of water above, will indicate this point.

Remedying defects in a drain when the flow of water is great, and the soil silty, is rather a delicate proceeding. Working men will, in nine cases out of ten, to save themselves trouble, put you to a great expense by turning the accumulated muddy water through the rest of the drain, causing it to choke up in a dozen places, when, in all probability, it will all have to be taken up and relaid at a great expense, as I know to my cost, having been served in this way when the very deepest drain on my farm was in question. So that it is better, at once, to sink a hole below the level of the drain, and pump the water out till the tiles have been taken up and relaid; for the reader must recollect that a small tile, perfectly laid, and that will answer as a condict for pure clear water is easily filled up with matter held in suspension.

The water in tile drains, after the ground is settled, is almost always clear and pure, which it naturally would be, on account of the way in which it gets into them, not as unreflecting persons would imagine, from the immediate supply of the rainfall, but by gradually saturating the soil until it meets the water already there, when the whole water table rises until it comes to the bottom of the tiles, which it enters and escapes.

I am able to give a very good illustration of this, for having noticed that all my tile drains were running freely after the last rains, I ascertained that not more than six inches of frost had gone out of the ground, consequently it is obvious that the water table has been raised by an increased supply that has had no connection with what fell in the vicinity of the drains.

The foregoing remarks on the action of water on the land in connection with drainage, may also explain why it is impossible to over-

drain land, for it can be seen that the drains can only take away what water should run off by the force of gravitation, while it would have no effect on the large mass held by attraction.

A very simple experiment will prove this, by taking a box of dry pulverized earth, and with a dozen auger holes in the bottom, you will be astonished at the immense quantity of water it will hold without parting with any through the holes or drains.

But it is well known that draining actually preserves land in summer from drought, this is on account of the fine state of pulverization the soil is brought into by the percolation of the water through it, and also by the admission of frost and air. When heavy thunder storms come up in summer the pnlverized earth can retain the whole of the water instead of venting it into the steams and gutters from under a hard pan, as is the case in undrained land.

I have seen the water pouring down the open furrows of my neighbor's fields in summer, after rain, while my land has not parted with a drop from the surface, and rarely any from through the drains, showing that the whole of the water was held in the land by attraction.

No mention has been made of silt beds or holes, as I did not consider they would be necessary if the drains were properly constructed, their only use being when the water of an open drain is conducted into a close one, a practice I never follow, always preferring to flow it over the land and allow it to filter into the drain through four feet of earth. But I was astonished lately, in taking up an American Agricultural Journal, to see a communication from a writer who professes to have had great experience in draining. After describing his way of laying his drain with stones, he states that it is absolutely necessary to put silt beds down every hundred yards or so, to be cleaned out annually, and that he has always found them to fill up in that time.

I never had such a thing in fifty acres of silty soil, and at the main outlet of ten acres of drainage, there has not been a pint of sediment deposited in ten years, and it could be plainly seen, were it otherwise, as no open streams connect.

The fact is, the person in question creates difficulties by ignoring the principles of drainage, and then has to go to an enormous expense to remedy the defects.

Scientific drainers do all they can to prevent the water from having direct access to the drains; others encourage it by placing large openings of stone.

No wonder, when farmers are told by those who profess to be able to teach, that it is better to put down inefficient stome drains at a cost of two dollars per rod, than to do first class work at less than one half the cost, that agriculture languishes in America and that people prefer putting their time and capital into any other business.

CHAPTER III.

DRIANAGE IN CONNECTION WITH THE DYKE LANDS. DRAINAGE OF DYKE LANDS MUCH NEGLECTED. SHOULD BE USED MORE FOR PASTURING. OPEN DRAINS UNADVISABLE. DYKE LANDS REQUIRE DEEP UNDERDRAINING, GENERALLY. DRAINAGE OF DYKE DEPENDS ON SUB-SOIL. EXPLANATIONS OF ILLUSTRATION. ON DIFFICULTY IN DRAINING DYKE. CLASSIFICATION OF LAND. REFERS TO THE SALT MARSHES.

The dyke lands are formed in Nova Scotia, from the sedimentary deposits of the matter held in suspension by the tide water of the Bay of Fundy. These lands extend over a large area of the country, and are exceedingly valuable, the best kinds being valued at from fifty to seventy pounds an acre. They are mostly used for growing hay, and are rarely, if ever, renovated by fertile ingredients being added to them. Very little is done to enable them to develop their utmost fertility, after they are once embanked or dyked in from the tide, beyond putting a few shallow drains to carry off the surface water, and even of late years these have been much neglected, but a mania for this kind of draining appears to have arisen lately, as I have not seen so much of this work done for a number of years. Although what benefit it is, or to what extent a waste of labor, we will endeavor to point out.

The same general principles of drainage apply equally to both upland and dyke, although the prevailing opinion is that they do not,but before examining into these different objections, it will be advisable to ascertain if it is necessary to drain the dykes at all, and in what particular instances.

In speaking of draining generally, I have shown that, perhaps for the growth of grass alone to make hay, draining may be more easily dispensed with than for any other crop, although even for this crop it might be a good investment, but in devoting the dyke land universally to the growth of grass for hay, are they put to the best use, and are the largest returns possible taken out of them? We think decidedly not. Surely common sense would suggest that land should be used for what it is especially adapted for, particularly when no other land can be made to serve the same purpose, and the dykes appear to be admirably suited for permanent pasture for grazing either dairy stock or fattening cattle.

The want of systematical farming in this province has led farmers to the belief that stock cannot profitably keep through the long winter, without devoting the produce of a great portion of these valuable lands to them, but experience has proved that hay alone is the most unprofitable food that possibly can be fed to stock, on account of its bulk and want of concentration, so that an animal, so to speak, cannot eat up more than his working or standing expenses, and the surplus that can be turned into beef is very small. In England, even with its mild winters, it has been found unprofitable to depend on hay for wintering stock.

Most farmers in this country consider that their hay does not pay them over three dollars a ton when fed out. So that the annual yield of these splendid lands would not be more than from eight to ten dollars per acre, which is too little.

The quality required in land to make first class pasture, more than anything else, is the ability to admit and retain moisture, so that a succession of succulent herbage can be continually thrown up during the hot weather. This quality the dyke has in perfection, so that no other lands can be compared with them, although uplands can be much improved in this respect by drainage and deep cultivation.

Food for stock in winter can be raised on any land, and it is only a question of skill and capital, but no amount of the latter can impart this valuable quality so necessary for permanent pasture.

So great a value is attached to these kind of lands in England, when used for these purposes, that I have heard of as much as twelve pounds an acre being paid for rent. So that it is Nova Scotia's own fault if she does not take a first class position as a grazing district.

The profits of grazing are also very large. In experiments made on five hundred head of cattle, it was found that during the five and a half months feeding, they would gain on a first class pasture, nearly two pounds per day, or two hundred and fifty pounds in the season. So that according to this, the present yield of the dykes might

at least be doubled, and the labor devoted to putting up so much hay, could be better employed in raising roots for winter consumption.

The success of a plan of this kind would depend on the details all being properly carried out in the first place, to fit the land for proper permanent pasture, and the first of these would be thorough draining when necessary.

If I am correct in my description of the principles of draining, and they apply to the dyke, the conclusion we would arrive at is, that the shallow surface drains, usually dug, are almost useless, or only useful in proportion to the depth If the idea is only to free the land from surface water, then by keeping it perfectly level, and digging one outlet, the same purpose would be effected without disfiguring the land by useless ditches.

Suppose you take an ordinary plain table with a level surface, and cut small open grooves in it, lengthways, and then pour water over it, now in what way do they facilitate the escape of the water? I cannot see that they would in the least manner possible.

It appears to me that the practice of digging these shallow drains has originated by our farmers following the example of older ones, who have benefitted their land greatly by digging very deep open drains, while a want of discrimination, or a wish to avoid expense, has led to a practice both useless and expensive.

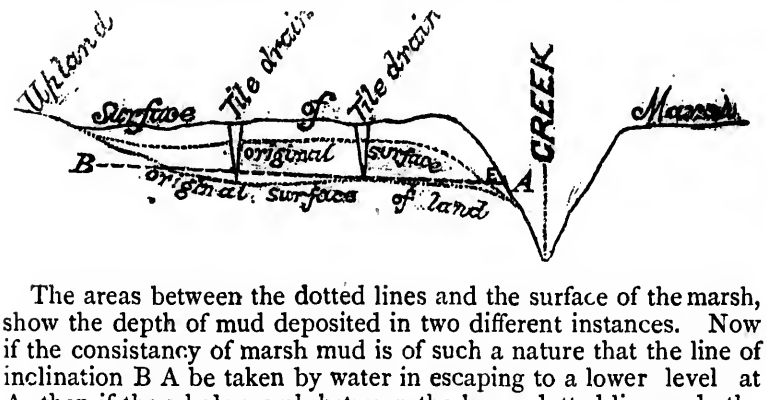
It is also very probable that the deep ditches have been dug on salt marsh preparatory to dyking, and accomplished the object in view when the lands and drains have subsided together.

There is one thing quite certain, that a very large portion of the dyke lands that I am acquainted with have all the appearances of land suffering from a wet impervious sub-soil and such lands are not fit to grow the finest pasture grasses, in their present state, no matter how many surface drains they may have; and I take it to be an undisputed fact that no lands can be hurt by surface water, provided the sub-soil be dry, unless, as sometimes happens, a severe frost catches it before it can run off, when the grass becomes scorched. Surface water is an indication of the water table rising to vent at the surface, and the only proper way to carry away this water is underneath the soil.

Although convinced that a great proportion of the dykes require deep underdraining, and nothing else, there are some kind on which this kind of work may be dispensed with, these are the very best of deepest dykes, and are generally bordered by a deep creek. These lands do not require artificial drainage, because they are naturally drained, and, to all appearances, entirely in accordance with the principles before enunciated. For suppose the nature of the muddy soil would allow the water to make its way to the bottom of the creek, acting as a drain at an inclination of one foot in ten, then a twenty foot deep creek would drain a space of two hundred feet wide, and it is the very great width of marsh land that does not require to be artificially drained, that leads me to believe, although entirely contrary to the general opinion, that these lands

could be drained very cheaply, as the tiles could be laid a long distance apart, on account of the resistance afforded by friction being so very small, also observing how quickly a newly cut drain will fill with water, has confirmed me in my opinion that the present method of drying the marshes is an expensive and inconvenient one. There is no doubt, the loss of grass in the first place would be quite an item if open drains were used, as it would require at least four open ditches of two feet in depth, to effect the same that one four foot tile drain would, while the land would be ruined for machinery. If the line of gravitation that water would take in escaping to a drain could be nearly determined by experiment, then the distances and depths at which drains could be laid, could be ascertained, provided the whole soil, to a great depth, was composed of the same material, that is the marsh mud. But owing to the way in which these lands are formed, this is rarely the case, as the mud is continually being deposited by layers till the land is raised to within a few feet of high water mark. The depth of the dyke depends on the formation of the original ground, before the process of deposition commenced, so that in making calculations for drainage, the character of the sub-soil, as extending over the whole area, would regulate the distances at which the drains should be placed apart, more than the top-soil.

The annexed illustration will explain the matter more fully:



The areas between the dotted lines and the surface of the marsh, show the depth of mud deposited in two different instances. Now if the consistancy of marsh mud is of such a nature that the line of inclination B A be taken by water in escaping to a lower level at A, then if the whole marsh between the lower dotted line and the surface be composed of this mud, it is plain that the marsh does not require artificial draining; but if the original surface be according to the upper dotted line, then, as far as the marsh mud is concerned, the creek can only be depended on to drain to E, and the distances at which the marsh can be drained, will not depend on the character of the present, but original soil, so that, in all probability, the marsh with the subsoil, according to the upper dotted line, would require to be drained with tile drains as shown on the plan.

This illustration will explain the reason that dyke land on the opposite sides of a small creek is often so different, as to the extent

of its dryness, almost within eyesight, is a piece of this description without a single surface drain in it, and which is apparently kept dry by one single deep creek that flows through it.

The objection urged to the draining of dykes with tiles, by persons who admit that they require drainage, are that in the first place, no fall can be got, and in the next that the lands are so stiff that the water could not possibly get into the tiles.

Both objections are equally absurd. The first cannot be called even an ordinary difficulty, for could no other plan be devised, it would not be a gigantic operation to cut through the standing dyke for a main outlet. but such a step would be quite unnecessary, as there are few dyke lands but what have creeks flowing into them that are from ten to twenty feet below the surrounding surface, and would serve for admirable outlets.

As the fall for the minor drains, particularly, would be small, the work would require to be executed with care and skill, and then there would not be the least danger of them proving inefficient, as both theory and experience has shown that tile drains require bat little or no inclination, and that whenever the ground is perfectly level, there is far less danger of sediment being washed into them, than when they are laid down a steep incline.

The second objection made, that the soil is so stiff that the water could not get down into the tiles, is founded on a want of knowledge of the principles of drainage, for as we have shown the water does not go down through the soil into the tiles, but rises up into the bottom. And if you dig into a marsh, and find water that indicates that it requires draining, and you may depend upon it that it will run into the tiles in the same way that it does in other land.

It appears to me to be a mistake to class dyke as very stiff, consistand soil. I am aware that it requires great power to turn over a furrow slice of old lea, but so it would with almost any land, laying under the same circumstances, undrained, sodden, and with the accumulated grass roots of the growth of years in it, and the only analysis of marsh mud that has been made does not make it a stiff soil, as it contains eighty-seven per cent of sand.

The dyke lands of Nova Scotia may be divided into three classes, first class dyke, second class or medium, and poor or almost worthless.

Also a few remarks may be made about the salt marsh. The very best of dyke is generally that laying on the borders of the creeks, and when the depth of mud deposited is great, their fertility appears to be inexhaustable, and perhaps nothing can be done to improve them when naturally drained, but they certainly might be made to grow more valuable crops, particularly when enriched with phosphate manures, in which they are deficient.

The second class are those extending back some distance from the creeks and having a medium deposit of mud on them.

Although what quantity of mud it is necessary to have deposited to constitute firsh class dykes, I am unable to ascertain, some men appear to think that two feet of deposit is quite as good as a great-

er depth, but it is well known that the depth mentioned is not, by any means, the limit to which plants will send the roots, if as good an opportunity as the dyke gives is afforded. I, myself, have traced the fine fibres of the grass roots over four feet in depth in the soil.

It might be supposed that from the great depth of soil, the dyke gets its ability to grow continuous crops of grass, but if this is the case, how can the fact be accounted for that the first crop, after plowing up is as good as any succeeding ones.

These lands undoubtedly require tile draining, for, as I have shown, they cannot free themselves from water on account of their subsoil.

The poorest dyke is that which lays at such an elevation that only high tide can cover it, and consequently little or no mud can be deposited.

When the soil is naturally of a swampy nature, deep drainage is very effective, not only because the land settles considerably and therefore the greater quantity of mud can be deposited, but because, when saturated with water, the tide cannot deposit any sediment. Tile drains would, in this case, be far more effective and cheaper, as they could be put in to a much greater depth than open ditches could be dug, without moving so large a mass of earth.

On some of these poor dykes, lime is extensively used to restore them, and with good effect, although it would be better if thorough tile draining preceeded its application.

The salt marshes are those lands that are covered with the tidal deposits and that have not yet been reclaimed by embanking or draining. They are valued in the same way that the dykes are, or according to the quantity of mud that is possible to be deposited on them.

It is usually the practice to dig open ditches of from sixty to one hundred feet apart, and from eighteen inches to three feet deep, through these lands before dyking, as it is supposed to improve the quality of the soil, and encourage the rapidity of the deposit.

There can be no objection to this practise, that I can see, only that the work would be done much more effectually by using tiles. The muddy water would have a tendancy to percolate through the soil, and escape by the tiles, carrying only what matter was in solution, and leaving that in suspension on the surface.

CHAPTER IV.

COST OF DRAINING THE DYKES.

I am not aware of any attempt ever having been made to drain the dyke lands with tile, consequently any estimate of the cost of such work that is made may be unreliable, but from a knowledge of the peculiarities of the soil as compared with other land, some approximate idea may be arrived at.

The dyke lands, from their close proximity to the Bay of Fundy, offer a good chance of transporting tiles from any of the surrounding harbours, and the numerous creeks afford a good chance of depositing the material on the spot, so that at least the cost of the latter need be no greater than that item in my estimate for upland.

The distances at which the drains should be laid apart would depend, as before shown, on the quaatity of mud deposited, and shape and character of the sub-soil, but it would be safer at once to test the matter by experiment.

The drains in soils of this discription could be cut with such accuracy and nicety that I should think collars could be dispensed with without running any risk, but the bottom should be secured by a board. On account of the small descent afforded the work should be laid out and supervised by a competent person, particularly when laying drains in salt marsh, as any inaccuracy in the bottom would have a tendancy to collect the sediment in the tide water, although, with care, no great danger need be anticipated, as the head of water on the marsh would keep all clear, or clappers could be put at the mouth of the drains if danger was apprehended from this cause.

The same objections to laying drains under four feet in upland, would almost equally apply to the dykes, but on account of the freedom from stone, the work ought to be taken at one third cheaper or twenty cents per rod, for the width for the cutting could be the very minium that is ever used for this work, so that a four foot ditch opened at a width of eighteen inches, and tapering to four inches, would only require the excavation and removal of about two cubic yards to the rod.

I have not spoken of the use of machinery in connection with cutting drains, because I have never seen any used, although, I believe, one ditching machine has been at work in Nova Scotia, and has given great satisfaction. The great objection to them appears to be, that they only cut to a depth of three feet, so that the drainer is put to an extra expense of about six dollars per acre, to increase the proximity of his drains, besides having to incur the risk of injury by frost.

I have endeavoured to ascertain whether these machines leave the ditch in a state to allow of a man taking out the other foot, but have failed in getting this information. As they are warranted to cut two hundred rods per diam, on ground free from stone, they would certainly answer well on the dykes, and make the draining very inexpensive, although I should certainly approve of the excavation of the extra foot by manual labor.

MANAGEMENT OF A FARM

OF

ONE HUNDRED ACRES,

With forty Acres of Dyke for Pasture, according to the principles enunciated.

CHAPTER I.

AMOUNT OF CAPITAL REQUIRED, MUST BE ASCERTAINED. REMARKS ON SCHEME PROPOSED FOR STOCK FARM. FARMERS' PROPER POSITION ON A FARM. SIZE OF FARM. GENERAL ARRANGEMENT. FARM BUILDINGS. WATERING STOCK IN BARNS. CAPITAL REQUIRED. CHOICE OF SOIL.

It is absolutely necessary, before commencing farming, with any hopes of success,that the amount of capital required to bring the quantity of land to be worked into perfect development, should be thoroughly ascertained.

In England a farmer, on newly entering a farm, has little difficnlty in this matter, as the necessary investment per acre is pretty well established; but in America, where land is abundant and cheap, a farmer need only be limited by the extent of his purse and judgment.

Practise and experience have not established any definite rule, consequently, as may be imagined, there is a very great difference of opinion regarding the matter.

I notice by the papers, that a gentleman in Halifax has proposed the establishment of a model farm, to be used for a dairy and for stock, to be worked, or made, or what, for I have seen no details of the plan, on a capital of five thousand pounds.

It would be unfair to critisize the plans of others, when I have so little knowledge of the means to be taken to carry out the work, but I cannot forbear reiterating the remarks before made, that I do not understand why so much importance should be attached to developing the auxiliaries of farming, and leaving the most difficult, necessary, and important part to take care of itself, which it most surely would not do.

If it is desired to establish a farm that will be valuable as instruction and an example to the public at large, it should be one where the greatest difficulties attending a farmer's occupation are considered and overcome. Now the making of butter and cheese, and breeding of stock, although requireng great care, prudence and skill, certainly cannot be classed as among these.

Should stock farms be established by the Government or companies, in the present state of farming in Nova Scotia, the chances are that the food raised for their keep would be so expensive that the investment would prove unprofitable, and die a natural death, adding another warning, instead of encouragement, to the public. With regard to the amount of capital named in the scheme referred to, I do not know how it is proposed to invest it, but the following pages will give a clear idea of what my opinion is on the subject.

I take it to be a fact admitting of little controversy, that the heaviest returns per acre, over the whole of the land farmed, are those which bring the greatest profits, and ensure the greatest success to the farmer.

The numerous expenses attending farming, which are permanent and do not vary with the yield of produce, make this necessarily the case. So that in my estimates for the amount of capital required for the hundred acres, I shall name such sums as I consider absolutely necessary to produce these results.

I have also chosen an area of one hundred acres of arable land to suit the scale so that the necessary working power attatched to the farm, would best assimilate, as for instance, you cannot class any operations of this kind as high farming, unless you include sub-soil ploughing. Now this requires two pair of horses, so that it is necessary to work sufficient land to give them employment all the year round. Also the permanent assistance kept render this necessary, as few operations can be carried on by one man alone, and unless the proprietor undertook to supply the place of one man permanantly, which is both unadvisable and almost impossible in carrying on a farm like the one described; (not that there would be anything dirogatory it the practice, as no one need fear

anything of that kind on this side of the Atlantic,) but the combination of work makes it necessary that its component parts should be perfect, so that if the master of the farm once placed himself in the position of one of the four or necessary wheels of the coach, he would always have to remain so, and consequently work would be neglected that could be done by him and him only. Suppose, as will be shown, that it would be the case, that there were a large quantity of fat cattle on hand at Easter, or when the spring was opening, and the farmer had undertaken to unload his own manure, while the other man drove the team, one cart remaining to be filled, then in case of the periodical visits of butchers to purchase the cattle, two teams and one man would be thrown out of work until the farmer was disengaged. Besides I think it will be seen that he will have plenty of employment in work that properly belongs to his own department.

It is almost impossible to attach prices to farms in America just now, which would be any guide in purchasing, but as this article is more to illustrate a principle than to give any information that way, it will not be of much consequence, but I will endeavour to state prices at which land can be bought, so that in case of a profit being shown, I shall be sure to be on the right side.

A good upland farm of one hundred acres of meadium clay, or a clay loam, with forty acres of medium dyke could be purchased in Nova Scotia for about seventeen hundred pounds. It would be desirable that there were no buildings upon the property, as in all probability they would not be adapted to the wants of the farm, and it would be cheaper to erect new ones than to alter the old ones.

I have chosen a clay loam, as being the best class of lands we possess for general crops, although they nearly all require thorough underdraining before they can be worked to profit and advantage.

I have only rated the dyke at thirty pounds per acre, as it is only intended for permanent pasture, and as it would be improved more than exhausted, it is probable that this land would answer the purpose for which it is intended.

According to the plan before recommended, the purchase money would be borrowed from a loan society to be repaid by instalments extending over a period of twenty years, with five per cent interest so that the annual charge would be £170.

The charge for drainage would be one hundred acres of upland at ten pounds per acre, one thousand pounds; forty acres of dyke at thirty dollars per acre, three hundred pounds; total, with interest, at five per cent, for twenty years, two thousand six hundred pounds, annual payment, £130 per annum.

It is impossible to say what the cost of buildings would be, but I have placed the total at one thousand pounds.

The stock and crops would have to be accommodated properly first of all, and the balance devoted to the building of a dwelling house, which should be so planned as to admit of additions when circumstances permitted of its being done.

I do not think that the present style of barns, in general use, are either economical in their first cost, or convenient in their arrangement, for either the whole surface has to be shingled at a great expense, and when not necessary, for the protection of the crops, or the stock is left too much exposed to the clemency of the weather. Also when the ground mows are filled, the remainder of the crops are stowed away at great inconvenience and expense.

I believe that in England these large barns were the protections generally used till the improvements in farming suggested the adoption of a better method.

The kind of barns I should suggest, as best suited to the requirements of a farm of this kind, are those that would be built so as only to hold hay enough to last the cattle tor a fortnight or three weeks, when the mow would require to be refilled from the regular hay shed.

From accurate calculations, which are not published in detail, I find that this style of building could be finished with just two thirds of the material required for the old kind, to accommodate the same number of cattle, so that enough material would be left to build sheds for grain and hay, which need not be shingled, but only well and neatly battoned. Only one side should be boarded, and the roof have but a slight inclination. The sheds should face inwards to protect the barnyard.

The advantages of this arrangement of the buildings would be that the hay and grain could be easily stowed, as there would be no pitching from one man to another, and that all the stock and crops could be safely housed at two thirds the cost at which they could be in the old manner.

Also the large elevated barns generally built in this country are continually racked by the wind, and are a constant expense to keep in repair, besides being very unsightly.

I would suggest that the root cellar be dug right under the barn floor, and should be of a capacity to hold about two thousand bushels, or enough to last the fifty head of cattle for three weeks.

It would be desirable that the quantity of cattle fattening on the farm should be divided in two different lots, for which two separate sheds should be built, with a root cellar under each barn floor, about one hundred and fifty cubic yards of excavation would be sufficient to hold the specified number of roots. The flooring above the cellar should be so arranged that the roots could be tipped in by the removal of planks in different places, or by the use of trap doors. By this arrangement the time of one man at least is saved in the fall, as no stowage is required. As the lifting of a large quantity of roots daily is a work of no little labor, some mechanical contrivance should be used to faciliate the operation, and I do not see why the horse fork tackling would not be as convenient as anything else, and could be worked by man or horse power, in the former case with multiply blocks.

The first thing necessary, before laying out any capital, would be to obtain a throughly accurate topographic plan of the land to be

farmed, upon which every building, field, road, &c., should be marked, previously to their construction so that it might be ascertained how each piece of work in detail harmonized with the whole arrangement. And the first thing to be looked to would be the disposal of the buildings, so that the stock could be watered in their stalls by underground pipes. Could this be done in no other way, reservoirs could be sunk in connection with the tile drains, and if advisable, the pipes could be carried on to supply the dwelling house, with a faucett attatched, to clean waggons, &c. These may appear to be trivial matters at first sight, but I think it will be seen, that, upon the proper arrangement of them, at first, the whole economical working of the farm depends.

I have not attempted to give any detailed plans of a barn, as they would occupy too much space, and I would naturally be of the opinion that the different methods I adopted myself, after finding, by experience, them to prove successfull, would be the ones I would recommend to others, thus: I do not approve of putting cattle in stancheons, particularly when becoming fat, neither of giving them less than five feet of space to lay down in, as I have seen fat cattle injured by being closely confined.

I allow the sum of one thousand pounds for building. This money I also propose to procure from loan societies, so that this would make another charge of one hundred pounds a year, to cover interest and principal. This sum, with the money borrowed for drainage, and the purchase money for the farm, would bring the amount to £400 per annum, to be paid from the crops.

We now come to the farmers' investment. I consider that all the necessary stock and machinery for the farm could be purchased for about three pounds per acre, three hundred pounds in all, not including the lean stock that would require to be purchased to fatted. And as this will be the main business carried on, it will make a great difference in the amount of capital required to farm successfully. Whether any institutions can be established in the country, whereby farmers can borrow money to purchase lean cattle, giving them as collateral security, or not. This is another innovation that our advanced farmers will have to aggitate, and there would be nothing unreasonable in the request, for such accomodation is already given in Canada and the Western states.

It is not necessary to explain exactly what machinery would be required in addition to what is generally used, for a pretty good idea can be formed as the progress of the work is described.

It would be necessary that two cottages for laborers should be built, and then married men could be employed without their having to travel long distances, backwards and forwards, to their homes.

I find upon inquiry, that the sum specified, £1000, would be just sufficient to pay for the erection of two barns to hold one hundred head of cattle, also two cottages for laborers, and open sheds for storing grain and hay, and that a balance of about four hundred pounds would be left, which could be devoted towards the ex-

pense of building a dwelling house. But it would be only by constructing the out buildings according to the plan proposed, that the sum of money mentioned would be found enough.

I intend to describe the method of carrying on a farm of a hundred acres, according to the four course rotation, because it suits the style of farming that I should recommend, and which I have had most experience in.

I have assumed that all the land wants draining, as almost all clay soils do, it being a very rare occurrence to find one resting on an open or porous subsoil, and I have chosen a medium clay soil farm, as an illustration, because I believe that, although at first they are expensive to manage, that after being properly drained and wrought, they are the most profitable soils to work, except in isolated cases, as where light sandy land can be made to grow potatoes when they fail elsewhere.

CHAPTER II.

COMMENCING OPERATIONS. MACHINERY WANTED. MANURING CROPS. ESTIMATES. DR. AND CR. ACCOUNT.

The farm having been purchased, and all pecuniary matters being arranged, the first thing to be done after the sites of the buildings have been staked out, according to the plan, is to commence the drainage, these having all been staked out by the government commissioner, with the depth of cutting marked at every fifty feet in the main drains, and in the minors where it is necessary.

I shall suppose the young farmer takes possession in the spring. The land should be neither broken or rocky, and not too hilly, for there is quite enough land to be purchased in America, in different localities, without the farmer increasing his difficulties needlessly. I do not, however, object to parts being of considerable elevation, provided the slopes are regular.

The operations of the first year would naturally be contracted, and perhaps it would be advisable to attempt nothing in connection with actual farming, with the exception of the plowing of fifty acres of the rotation, twenty-five for oats, and twenty-five for roots, the

two teams would be fully employed in carrying the tiles and collars from the wharf, yard or railway station to the farm, in hauling away stones brought up by the drainers, and in repairing the fences, and the farmer himself would find plenty of employment in using a general supervision over the buildings being constructed, the drainage, and in studying and maturing plans for the future, and in ascertaining what machinery, seeds, &c. it will be necessary to get and where. It will be also advisable for him to ascertain to what extent machinery can be used in cutting drains, and whether it might not be better to prolong the work over three or four years, doing it with his own horse and man power. As a general rule, and when there is sufficient capital to work the farm properly, and when the Government furnish the drainage money, I should say by all means get the work finished and off your hands as soon as possible, or the proper farm work will constantly be liable to be interfered with afterwards, and your teams called away when they are most wanted at home.

The portion of the farm on which the drainage was first finished should be that to be first plowed. I say portion, as for the four course rotation, no interior fences would be required.

The first process would be to back furrow over the centre of the drain, as a guard against subsidence. As this will be the centre of the ridge to be ploughed, this arrangement makes it inconvenient for sowing, but it cannot be helped, and the inconvenience only lasts for one year. If the drains are forty feet apart the ridges would be twenty feet wide, which is a great bredth to sow in two casts, and increases the time required to plow.

Twenty-five acres of the land to be plowed would be for oats, and twenty-five for roots. The former would only require an ordinary deep seven inch furrow. The twenty-five acres devoted to roots, could be worked in one of three different ways, the choice depending on the state of the soil, whether tough and compact or the reverse, (for I have presumed that the land was all in grass.) If the former was the case, so that it would not be likely that the sod would be rotten in the spring, then the land should be plowed very deep in the fall, and well harrowed in the spring, after which it should be drilled up very lightly, so as not to interfere with the burried sod. Or a third plan would answer, if the soil was light and friacible, the land should be very lightly ploughed in the fall, then well harrowed in the spring, cutting the sod in pieces, and then a good cross ploughing would finish the operation. But a method which would forward the work more in the spring, would be to plough deeply in the fall, and then cross scarify in the spring. By this means, the furrow slice would be cut into pieces, and the sods exposed on the surface, where the the harrows would soon reduce them to mould.

The implements to perform these operations with, should be wheel ploughs of the most approved pattern, as the old swing ploughs in use in Nova Scotia are completely out of date in countries where agriculture has made any progress, the dragging friction

caused in their progress through the soil, and the wedge shape of their mould boards, make them require almost as much power again to turn over a gived sized furrow slice as those of a newer pattern do.

On the opening of spring, the first operation will be to harrow the twenty-five acres of ploughed land for oats. The best harrows made, are the iron zigzag pattern, they rake the ground in lines exceedingly close together, and are not liable to clog

Farmers who have been accustomed to wet soil, will be astonished at the difference in the extent of harrowing required that the drainage makes.

The grain may be sown broadcast or by drill, and should be done by the farmer himself, although it is anything but easy work on deep loamy drained land to carry and deposit the grain for fifty acres of land, the only objection that I have to drills, is that the use of them breaks up one team, and in a very buisy season, it is desirable to sow oats as early as possible, and all grain for that matter; barley, if sown ten days or so after oats, is apt to catch up to the latter crop, and ripen at the same time, which is inconvenient.

The wages for the first summer, wear and tear, will be a charge on the amount allowed for haulage of the tliles and on the total capital allowed for drainage.

The oat land should be dressed with artificial manures, at the following rate: Five cwt. of good ammoniated superphosphate to the acre, at a cost of twelve dollars. Unless this liberal dressing was given the oat crop would not pay the expense of harvesting, in nine cases out of ten, on all farms that I have seen in America, and as in this case the straw is required for winter fodder, this expenditure is absolutely necessary.

The land having had the advantage of underdraining for one year, and laying dry all winter, a yield of fifty bushels of oats per acre might be depended on.

The root crop would also require a liberal dressing of artificial manures, as upon them it is entirely dependant, so that six hundred weight of good superphosphate to the acre would be required.

When so much artificial manures are used, it would be necessary to have machinery for both broadcast and drill sowing. In the latter the seed aparatus being attatched, whatever root crops may be sown on the twenty-five acres devoted to this purpose, I will estimate the returns as food for stock.

It is not probable that the produce of the land would be more than sufficient to feed two head of cattle to the acre during the first winter.

The root crop would be managed and harvested in exactly the way described previously in the account of my own experience, as I know of no better method.

In the fall, fifty head of steers rising three years old, would have to be purchased at a cost of ten pounds per head, for which sum very superior cattle of that kind could be bought.

About fifty tons of hay would, in all likelyhood, have been cut on

the dyke, and with an additional purchase of seventeen and one half tons of oil cake, at a cost of one hundred and seventy-five pounds, enough to give each ox five pounds per day, the stock could be well carried through the first winter. The financial portion of the farm could stand as follows, at the end of the first farming year, or at the commencement of the second spring:

Total amount paid to Government and loan Societies, (provided the buildings have all been finished, and the draining also during the last summer),	£400
Amount paid for wages, two men, at £65 per annum, with cottage, garden, &c.,	130
Extra labor thinning roots and harvesting them,	40
To seventeen and one half tons oil cake,	175
To one hundred and sixty pounds worth of superphosphate,	160
Wear and tear and Blacksmiths bills, 10 per cent,	30
	£935

Farmer's capital, £300, or £3 per acre for machinery, stock, &c.

Amount invested for the purchase of 50 steers, £500.

Total capital required by the farmer the first year,	£300
If the money could not be borrowed for purchasing cattle,	935
Cattle, &c.,	500
	£1735

PROBABLE RETURNS.

To 50 bushels oats from 25 acres, 1250, deduct seed and oats for horses, 1000 bus at 50,	£125
To 50 steers to be put on grass, valued at £350, increase	330
	£455
Deficit,	£480

It will be seen by the above figures, that the first year shows a deficit of nearly five hundred pounds, and pays no interest on the farmer's capital of over fifteen hundred pounds, but then he is one twentieth nearer the possession of his farm without incumberances, and besides I cannot see how this loss can be avoided. You cannot make a first class paying farm in a short time, and any farmer will, I think, find his energies sufficiently taxed to keep up with my progress on paper in the same way practically and on the ground.

I will not detail the farm management until the whole rotation is established, which it is desirable that it should be done in four years, which can only be accomplished by the utmost vigor and promptitude, for it can plainly be seen that if these annual deficits are allowed, the whole investment would be ruinous, and I think that a perusal of this chapter will explain more fully than anything that has been before written, why my own farming ultimately turned out to be a failure, although the means adopted towards a certain end were in themselves based upon sound principles.

The addition to the farm receipts for the next year would be twenty-five acres of barley from the land that had been occupied with roots, and an increase of thirteen pounds per head on the value of the cattle sold.

I have divided the increase of value to the cattle into three por-

tions, one third for the summer grazing, and one third for each winter feeding. The increase of value for a year and a half's feeding, is supposed to be twenty pounds per ox. This increase could, I am sure, be easily obtained, as I have repeatedly made as much in the value myself proportionately to the time of feeding.

The increase of outlay required would be two hundred and fifty dollars worth of superphosphate or Peruvian guano, to top dress the barley with, twenty-five pounds worth of seed grain, fifteen pounds worth of clover seed, so that the account for the second year would stand as follows:—

Total annual charges as before,			£935
Add. extra special manures,			62.10
Seed Grain, &c.,			37.10
			£1035
Capital investment as before	£ 735	Add. for oil cake,	100
Add. loss 1st year,	480		
	£2215		£1135
Returns, oats as before,	£125		
Barley, 25 acres, at £10 per acre,	250		
Increase on 50 steers for one summer and one winter feeding,	650		
	£1025		
Deficit,			£110

In the fall preceding the time that the last valuation was required, it would also be necessary to replenish the stock of cattle, as the sales would furnish back the original capital, which could be used for this purpose. An increased quantity of oil cake would be required, as, although the root crop would have increased a great deal on account of having the manure of fifty head of cattle applied to it in addition to the artificial manures, still it could hardly be expected to come up to the full standard of maintaining four head of cattle to the acre, so that the first year's cattle would have to be wintered on a limited supply of roots, with straw and oil cake, for which an addition of one hundred pounds is added to the annual expenses.

The third year, the farm should approach the full standard of crops, except that the oat crop would not be as heavy as it might be expected to be afterwards, when it followed the clover lea in rotation.

The farm is now supposed to be able to maintain the full stock of one hundred head of cattle, fifty to be sold annually, after a year and a half's feed. The twenty-five acres of clover takes the place of the dyke, and should furnish eighty or ninety tons of good fodder to be fed to the second years feeding cattle.

If I have made any omisions, it is in the charges for the second year, in not allowing sufficient capital for the purchase of hay to take the place of that cut on the dyke, which has been thrown out to pasture, after having been properly prepared for that purpose, which should be done by draining, deep plowing and harrowing, and seeding with proper pasture grasses.

It would be well to divide the forty acres into two fields of twenty acres each, and to sow with different kinds of grasses. A mixture

of perenial clovers would be suitable for the earliest grazing, and any of the grasses that are known to suit such land, and which could easily be obtained from good seedsmen, for the other.

We have among ourselves one of the most valuable pasture grasses known, the wild timothy, or meadow foxtail of England. All our grasses being valued for their hay producing qualities, this one is not by any means a favorite, and the object is to get rid of it, instead of encouraging its growth; but for a pasture grass it is invaluable, for which purpose our old favorite timothy is quite unfitted, as it will not stand close grazing, on account of its bulbous roots being so near the surface.

The dyke for pasture would be much benefitted by a top dressing of superphosphate, after the grass seeds had been sown, although no allowance has been made for this outlay in the estimate. A set of flexable chain harrows should also be passed over the land occasionally to spead the droppings of the cattle.

The following will be about the pecuniary position of the farm when the land has been brought into the highest state of cultivation and the rotation fully established.

I have followed the expenditures of the different years until the outlay and income become nearly equalized, so that no more additions need be made to the farmers capital, under the denomination of deficits.

Annual expenses, amount paid as before,	£400
Wages, £65 per annum to two men,	130
Extra labor,	80
Superphosphate or other special manure,	125
Oil cake for winter feeding, 37½ tons,	375
Wear, tear and blacksmith's bills,	30
Grass seeds,	20
	£1160

ANNUAL RETURNS.

Increase in value of 50 head of cattle at £20,	£1000	
To twenty-five acres of barles	275	
" " " " oats	200	
		£1475
Profit,		£315

Farmers capital required, £2215, as per account 2nd year; add. £110; second year loss, £2325, or five hundred pounds less if the money for purchasing cattle could be borrowed.

It will be seen, according to these figures, that it gives a return of about 15 per cent for the farmers capital of about eighteen pounds ten per acre. But in addition the farmer is gradually acquiring a property worth about seven hundred pounds per annum to him, for after twenty years his annual charge of £400 per annum ceases.

It is only on this principal I believe that farming can ever be made a profitable investment.

Too much dependence cannot be placed on these figures, although I have accomplished the work discribed in this article at the prices named, and have repeatedly raised the crops specified, and I believe that a farm, working on this plan, that the profits are not over estimated.

The largest published returns that I have ever heard of are those of Mr. Prout, whose working capital pays over thirty per cent. His system is peculiar, no stock are kept on the farm at all, and the land is entirely worked by steam power, but even he had to prepare the land by thorough drainage, which is charged to the permanent investment fund.

CHAPTER III.

FARMERS' INGENUITY HAS NOT BEEN TAXED. MANURING. FARM PRACTICE. WORKING THE ROOT CROP. DIFFICULTIES IN CHANGING. THE SYSTEM RECOMMENDED.

It is not necessary to go very deeply into the details of the working of the farm, as this is not intended to be a book on general agriculture, but I shall dwell mainly on the few points that are necessary to show in what way, the management must be conducted to suit the peculiarities of the climate.

The fact that our farmers have not as yet been called upon to use extraordinary means to carry on their business, I look upon as more the result of their being tied down to an impractical system, than showing any want of ingenuity on their part. Arrangements for working constantly at their business have not been made, as the extent of it was not sufficiently great to require it, their capital being locked up has crippled them from making large quattities of manure, consequently their minds have not been taxed to devise means for its proper application.

It will be necessary to consider in what branches of practical farming, we are mostly inconvenienced by the peculiarities of the

climate, without reflection, one might say in all, and perhaps this may be the case, but at least we have a more independent control over some than over others.

The manuring a farm properly, when barnyard manure is chiefly used, must necessarily occupy a great deal of the time of the men and teams, so that if left to accumulate till the spring, or until the land was ploughed, this part of the work could not possibly be performed in the proper time.

The quantity of cattle kept, would, in all probability, void about one thousand loads of manure during the winter, this should be carried to the fields during this time, and each pit emptied as soon as it had been filled. The manure should be drawn from the carts into little heaps ready to be spread. The only exception to this management would be in case of very deep snow covering the ground, when the manure should be placed in convenient heaps ready to be recarted as soon as the snow partly dissapeared.

The only objection I can see to the adoption of this system, is that the land would not be prepared for manuring in the drills, then it would have to be decided by experiment, whether to gain such great advantages in saving time in the spring, it would not he better to adopt the broadcast system of manuring entirely, and to aid the early development of the roots with artificial manures. But I think it will be shown that the farmer need not be so hurried with his spring work, but what he might manure a large portion of the land in drill, but these matters could only be decided by experience. It would also be well worth while trying the system of transplanting, for if it succeeded one half as well as it has been said to, the farmer would have pleanty of time to place the manure in whatever way he might think proper.

Wherever drills have laid any time without being sown, or plants being put in them, they should be lightly harrowed down, and then set up again, by this means the weeds are destroyed, and fresh earth is turned up for the seeds and plants.

The fall work of the farm would consist of the ploughing of twenty-five acres of clover lea for oats, the plowing and subsoiling twenty-five acres of stubble for roots, and storing and harvesting twenty-five acres of turnips and mangolds.

The land for oats could easily be ploughed between the last of the harvest and the twentieth of October, for medium clay land never bakes to be very hard if underdrained, then the root crop must be attended to.

The root crops should be pitted at the rate of two acres a day, by employing enough extra hands to keep the carts constantly on the move. This extra expense being included in the estimates.

The pits for the roots should have ventilators every ten feet, and need not be thoroughly closed until the winter sets in.

This operation being finished, the remainder of the open weather would be left for subsoiling, and ploughing the oat stubble. This work could be accomplished in twenty-five days, weather permitting.

The springs work would commence with the harrowing and sowing of the oat field, which work could be accomplished in four days with two pairs of horses, or by the tenth of April, in the climate of Nova Scotia, in a tolerably fair season.

The land that had been in roots should then be ploughed for the barley with two double furrow ploughs, so that the time occupied need not be more than seven days, with four additional for harrowing. The clover seed could then be sown by machinery, at the rate of fifteen pound of seed per acre. Only ordinary red clover is sown for the four course rotation, as it is undesirable that it should last more than one year. The field is then finished by passing a set of flexible chain harrows over it.

The sowing of grain and grass seeds should be performed by the farmer himself, and if horse-power is required, the driving or waggon horse should be used.

It is a very good plan in sowing grass seeds, when you have nothing to guide you, to fix three iron shod poles at equal distances apart in the field, denoting the line to be sown, then by driving or wheeling in exactly the range of these, you are sure to sow correctly, and on approaching the last pole, the operation can be repeated by removing them half the width of the seed sower from their original position.

The grain crops being all sown, the whole force of the farm can then be turned to preparing the land for roots. If the broadcast system is adopted, the work can be performed both rapidly and and easily. The manure has been spread partly by the permanent employees, when moist weather or slight frost has prevented them from using the horses, partly by additional hands.

The first operation to be performed on the root land, is to pass the scarifier or grubber across the field at right angles to the original line of plowing, care being taken that the tines penetrate deeply into she soil, almost to the depth of the land mellowed by the subsoiling. This work will require the whole power of the farm, but the twenty-five acres can be finished in eight days.

The land then should be harrowed, first with the iron zigzig harrows, and then with the flexible chain harrows. When the weeds and grass that have been bronght to the surface by the cross scarifying, will be collected together, and can be brought to the head ridges and left there by lifting the harrows. The land will then be clean and mellow, and the manure tolerably mixed with the soil, there remains then nothing more to be done, than to open the drills tor the various crops, and commerce the sowing, with or without special manures.

The only objections that can be urged against this system, is that the manure is not covered thoroughly with earth, that it has not become much decomposed in the heap, and that it is inconveniently long, and apt to catch in the harrows.

No doubt these dificulties would occur, but how can they be avoided, it is a choice of evils; to undertake to reload and cart the manure for twenty-five acres of land, and to wait till it has been

thoroughly worked and drilled up, would be to delay the sowing of the root crop fully for one month, when the result would be that these crops having plenty of manure, but no season to mature or utalize it, would be of less bulk than they should be, consequently the number of stock would have to be decreased; also the grain following, having more than its share of highly ammoniated manure, with the addition of the decaying tops, would be sure to lodge.

There is only one way in which I can see that matters can be arranged to suit all these circumstances, and that is by resorting to trausplantation entirely or partially, then the roots can be growing whilst the land is being prepared. Should this not succeed, the farmer, by following the whole system through as detailed, would have still more time at his command than any of our old style of farming allows.

The process of weeding and thinning must be done by the most approved methods, *i e*, by parting the drills after the seed and special mannre have been sown by machinery, and it only remains to make a few remarks respecting harvesting.

The grass and grain should be cut by machinery, but the latter not bound.

North America, as a rule, is not a hard climate to save either hay or grain in, but occasionally we have a bad catching. season, should this be the case, cut and cock as rapidly as possible, and do not leave a whole field of grain to get over ripe, for the sake of housing a few acres that are down.

In conclusion I would say that it appears, I am aware, to be a very easy thing to give instructions on paper, and to draw rows of figures, showing that certain results can be arrived at, but can they be depended on?

These chapters have been written more to illustrate a principle, than for any other purpose, but as far as the details of work and instructions for its execution are concerned, there is nothing recommended but what has been proved by my own actual experience to be practicable, and the reason that the final results to me were not as satisfactory as to the imaginary farmer here represented, I leave to the intelligent reader to account for.