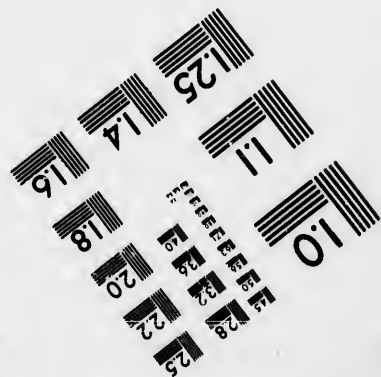
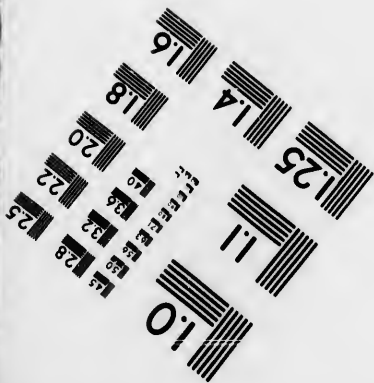
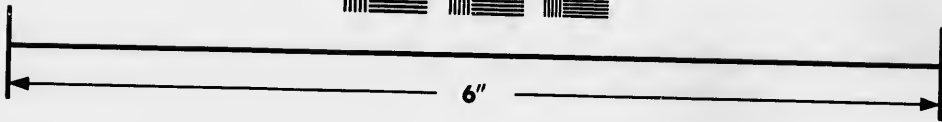
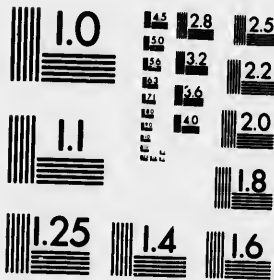


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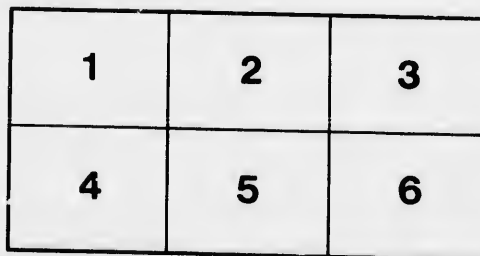
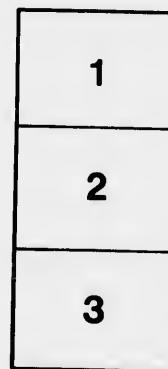
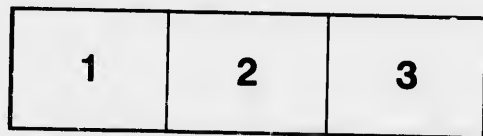
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DRAINAGE OF LAND,

AND ITS

NECESSITY IN THE PRESENT STATE OF THE
AGRICULTURAL INTERESTS OF CANADA.

A PAPER

READ BEFORE THE CITY OF TORONTO ELECTORAL DIVISION
AGRICULTURAL AND HORTICULTURAL SOCIETY,
12TH MARCH, 1859.

~~~~~  
BY H. J. BOULTON, ESQ., OF HUMBERFORD.  
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TORONTO:

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LAND DRAINAGE.

The exceedingly depressed condition of every interest of the Province of Canada must be a matter of great anxiety to every one interested in it, either as the country of their birth, or of their temporary or permanent adoption; and in seeking for the cause of our destitution, we should look to the source of our wealth, and enquire what is its condition. High authorities hold that the produce of the tillage of the earth is the foundation of the wealth of all nations, and it surely may be assumed without any elaboration of argument that the paramount interest of Canada is its agriculture. Our population is thin and scattered, our lands are more abundant than we can occupy and subdue, our very towns and cities do not exclude from their limits, nay, almost centres, the occupations of the country; yet, with all these circumstances surrounding us we have an absolute scarcity of every article in the commonest demand for the support of both man and beast, and instead of drawing upon the fund of our agricultural products to pay for the luxuries or rather for the very necessaries of life, we are on the eve of having recourse to a foreign market for what should be produced in excess of the demand at home. A paper relating, as this does, to the general subject of farming, may at first sight appear more suitable to be read before an association of a rural district than one the majority of whose members probably restrict their practical operations to the garden and the green house; but the very liberal manner in which it is well known many of the townspeople of Toronto have supported some of the neighboring township societies, removes any hesitation in addressing them on the subject. Independent of the fact that farming ought, after all, to be gardening on a large scale, there is another indirect interest. A few days ago a friend was speaking of Rochester as he knew her when the Genesee valley poured its treasures of wheat into her mills, and the difference now, when one rarely sees a wagon load of wheat in the street.—Rochester had her manufacturing power to fall back upon, but what will become of our towns if the produce trade fails them. Here is a powerful incentive, and the inhabitants of Toronto as the centre of perhaps the most influential farming district of the Province, should at once take up the subject of the present failing interest of agriculture, and discuss and devise and advocate measures for its relief. For many years past the very high price of wheat has tempted the whole farming population almost to abandon every other article of cultivation, and consequently the other grains, with all roots, vegetables, dairy produce, hay and fodder, have become so scarce as to have reached almost fabulous prices, and now as an overwhelming misery comes the blight and failure of what was expected to be the golden harvest.

As the inhabitants of a young country, and a people who have, as a majority, carved out for themselves competence and comfort, we have too easily and generally given way to a practice of self gratulation, laudation and complacency, which has been too readily encouraged in all addresses made to large gatherings of our people. A very little practical thought would teach us that we have yet a vast deal to learn, and immense improvements to accomplish. Compare any English farm steading with our barn premises. In place of roofed buildings

here, barely filled with the crop of whole farms, there one finds in a rick-yard, dozens of stacks large enough each to fill a moderately sized barn, and the straw when thrashed, instead of being cast out to decay in the course of perhaps two or more seasons, or at best thrown to be partly eaten, partly trodden under foot by a few half-starved cattle, is carefully preserved to absorb the liquid, and be mixed with the solid manure produced by cattle fed on the richest and most nutritive food.

Our productions in the aggregate have been very great, but the extent of the lands from which they have been drawn has been generally unknown, and their gradual fall from fertility to impoverishment has been unnoted. By the census return of the year 1851, (which was before our wheat was attacked by the ills with which it seems at present threatened,) it appears that the yield of wheat in fourteen counties in Upper Canada, varied from 16 to 20 bushels per acre. The County of Bruce, in which the total yield was small, averaging 20 2-60 bushels, while among the older counties, Brant, Halton, York, Oxford, Kent and Peel, ranged next in the order in which they are placed, from 19 2-60 bushels down to 18 3-60 bushels; the total average of Upper Canada being 16 14-60 bushels per acre, while in Lower Canada it is 9 50-60 bushels, and in Ohio 12, about the same period. While for Scotland for the year 1854, the average is no less than 28 56-60, and in England, I believe, the average is set down at the same period by Mr. Caird at 3½ quarters or 30 bushels. While dwelling upon these figures it may not be uninteresting to state the relative proportion of land occupied in England and Canada in the growth of grain and root crops, which will easily be seen in the following tables :

	Root and green crops.	Grain.	Grasses.	Pasture.
England, acres,	3,069,215	8,476,592	2,820,066	8,874,946
Upper Canada,	96,285	1,598,482	698,727	1,361,846

The proportion of the first two columns being for England, about as 1 to 3; for Canada, as 1 to 16. The tables from which the above statements are collected, set down the acreage under tillage, irrigated meadows, and permanent pasture.

England.....	17,484,144
Upper Canada.....	8,702,783

These remarks are not applicable solely to Canada. In a late paper, (*Leader*, 3rd March) was published an extract from an Ohio agricultural journal, showing that the same results are to be observed there. Although from the year 1840 till 1850, there had been a large addition to the number of acres under wheat, yet there had at the same time been an actual diminution in the amount of the produce, to the enormous extent of over 2,000,000 of bushels. This is attributed by the Ohio editor to bad farming, but the remarks upon the extract doubt this, throw all the blame upon the soil, and express an opinion that while all the west and so many acres of wild lands remain open for cultivation high farming does not pay.

In the first place, I would ask, how many and where are the instances in which high farming has been tried in this country, and where are the returns on which to ground the assertion that it does not pay? As a second question: is the mission of civilization in this continent to pass over the face of the country from east to west, like a desolating cloud of locusts, to exhaust the natural richness of the soil, and leave nothing behind but a barren and profitless waste. It would be far easier to husband and sustain the strength of our lands than resuscitate it after once suffering it to sink.

This unfortunately has been the too common course, but is not to be attributed entirely to the improvidence of our farmers. In many, nay, almost all cases, they

have had to struggle with the disadvantage of empty pockets, if not indebted for their very lands, and attention has been paid necessarily only to those things which would bring an immediate remuneration, therefore the bulk of their timber has been early disposed of, and the riches of their lands drained by continual crops of what formed the most ready source of a money return, no attempt at the same time being made to sustain the once teeming earth with those manures which should have been accumulated in reserve for its refreshment, and no rest being afforded by that judicious rotation of crops which the power of landlord has long enforced upon the tenant farmer of the old countries. There, in addition to the great efforts which have been made by private individuals, the Government have not and do not think it beneath their notice to discuss in all its bearings every question connected with agriculture in the halls of the legislature, and from discussion to proceed to action, to encourage and assist and impel the farmer to improvement.

If this course has been considered advantageous and necessary in a country where the control of, and the motive to amelioration, is centralised to a certain degree as it were in the hands of a few large landed proprietors, who certainly have in England most nobly fulfilled their duty, how much more imperative should be the necessity for our Canadian legislature to take a leading part in the same direction, in a country cut up and divided amongst a population personally independent of and uncontrolled by any mutual bond or united action. In the early settlement of the country, it was well, in fact it was useless and impossible to do otherwise than, to leave the hard working and skilled pioneer to reclaim in his rude way the virgin soil from the gloom of the forest; for in this early stage of the earth's subjugation, and for many years after, there was no scope for the application of the niceties or the science of agriculture. Time alone was necessarily the main agent for the removal of the deep rooted stumps, that imperturbable obstacle to the refinements of the art. Tillage crops could not be thought of among the wide spreading roots, and the only resource was the bare fallow and the cultivation of grasses. Here consequently was no field for the capitalist or the man of science, all was to be accomplished by simple labor, and the exercise of frugal patience; and a large portion of our farming population have commenced their agricultural career, placing more reliance in, and in many cases having more knowledge of the use of the axe, than perhaps the plough, or the hoe, or the spade. Many even of those who came to their new homes accustomed to the labor and practice of farming in the old countries, from force of the entirely different nature of the new from the old sphere of action, being compelled to abandon their accustomed method of working, have apparently lost sight of their ancient usages, or cannot now realize that with land in the same condition, at all similar systems are necessary or applicable to the two countries; and, after them, newly arrived colonists either fall into the same course of husbandry as their predecessors, or failing to appreciate the points of difference between their new circumstances and what they have been accustomed to, fail of success, and so serve to discourage any attempt at changing the prevailing course.

This, however, might have been attended with better results, had greater attention been bestowed on surface drainage, and more care and seed been used in the laying down of meadows, and by abstaining from too soon breaking them up for the careless and hasty growth of grain crops. As a counterpoise to this faulty system of management, the earth had not yet lost its youthful strength, nor that free and permeable state which can easily be imagined to have existed in its primeval forest days. This natural condition no doubt may be reckoned among the principal sources of the fertility of newly cleared land. In the unbroken forest, although the water may be retained by natural encumbrances of

fallen timber and leaves, the soil is not subject to that rapid evaporation which takes place when once exposed to the scorching sun and no less scorching wind. A large portion of water which does not escape over the surface, is taken up by the roots and fibres of the trees, and so consumed, while the remainder sinks to a much greater depth into the soil, in its natural light and open state, than it does in cleared lands. These, as soon as the timber is removed, are thereby exposed to the sun and wind, and lastly to the treading of cattle, both at pasture and in the ordinary operations of culture, until the subsoil is at last reduced, at least in the strong and heavy soils, to a state of consolidation, alike impenetrable to the roots of crops sought to be grown upon the surface, and hostile to the fertilizing effects which would otherwise be produced by the percolation of rains through them.

One of the most important operations in husbandry, is the provision of adequate and advantageous means for the escape of superfluous water from the soil, and, for the most part, and until comparatively late years, even in England, this was considered to be fully accomplished by large open drains at the bottom of each field, into which the water was discharged by open furrows between the ridges into which the land was formed. This open furrow is intended not only to receive the water which flows over the surface, but being ploughed slightly lower than the depth to which the ridges are tilled, should also prevent the accumulation and consequent stagnation of water under the surface of and through the stratum of ploughed soil. It is then, in proportion as the bed upon which this cultivated soil lies is shaped so as to promote the escape of water into the open furrow, that ploughing may be to a certain extent, deemed good or bad, and in order to attain this object all the furrow slices should be of the same thickness, which, of course will ensure the ploughing to be of the same depth, and the surface level, or perhaps rather higher in the centre. Instead of this shape being given, we often see lands formed with the borders thrown up higher than the portion immediately within, and perhaps level with what should be the crown of the ridge, and thus an obstacle presented to the ready flow of the water from the seed bed. This perfection, however, could not be expected to be attained where land is encumbered with such obstacles as the roots and stumps of trees, but should never be wanting in lands free from such impediments; and it is for this reason that wheel ploughs have been adopted, even in England, where, although the best of ploughmen are to be found, there is not perfect certainty of getting workmen who are capable, or at least careful enough to accomplish this most important requisite of good ploughing. Another point to be observed in the laying out of the ridges in a field, is the direction in which they should be drawn, in order to afford the greatest facility for the collection of the water. It will easily be seen that if the furrow be ploughed across the slope of the land, the water can only be drawn from the land on the upper side of the open furrow, and consequently will have to find its way across the whole ridge, whereas if the lands be layed out as near as possible in the direction of the greatest fall of the surface, the water will naturally be drawn from the centre only of the lands on each side of the open furrow. When these objects are not or cannot be attended to, in many cases there have been and will be constant failures and disappointments of the results sought after with much other careful and well bestowed labor. The finer the tilth to which some soils may be reduced, the more injurious will be the effects of the accumulated rains stagnating in the finely powdered mass, which will then run together and become consolidated into a substance more fitted to resist the pressure of a well loaded waggon-wheel than to afford a medium through which the buried seed should send forth its delicate germ, or the struggling plant should penetrate its tender rootlet in search of nourishment. The water being

now collected, ready to be discharged from each individual field, or it may be the whole property of one owner, we come to a point when the assistance of the legislature is absolutely necessary in this country, where, as has been remarked before, no man is constrained by any force but that of his own will, to advance the interests either of himself or his neighborhood, which are so closely connected. There are at the present moment and have been for years, thousands of acres of the best lands in the Province almost valueless for want of proper regulations for general drainage, either by opening outlets where necessary, or by the disencumbering and keeping clear of natural courses for the flow of the water. In the municipal corporation acts, to be sure, a hint has been as it were casually made at the subject, but the remedy pointed at has been directed to commence at the wrong end. The clause to which I allude asserts that when drainage is required, the land which lies at the highest level is to be drained first, and then the drainage of the lower level may be compelled by certain round-about means. A subsequent enactment (22 Vic., ch. 99, s. 271) provides that where a majority in number of resident owners of property in any part of a township, petition for the drainage of the property, the council shall have power to pass a by-law to carry out their wishes. Now, in a matter of such great public utility, it should not be left to the judgment or discretion of the unthinking, careless, and unenterprising majority of a community, if such happen to be their character, to exist, by their simple *vis inertiae*, as a bar to the exertions and progress of their more energetic and improving neighbours, who, unfortunately, may form the minority. Facilities for drainage are necessarily an advantage and profit to every portion of every neighborhood, and when the natural fall of water lies from one farm or piece of land through or across another, and this fall is required to be made by the owner of the higher land, the proprietor of the land on the lower level should be compelled to construct an out-fall of the requisite depth to afford efficient drainage, from that on the higher level; and as this should be done between individuals, the same regulations might be applicable between municipalities. A few days ago some resolutions were introduced into parliament by Mr. Malcolm Cameron, to authorise municipalities to impose special rates for certain local improvements; perhaps they were intended among others, to touch this particular case, and to no more important measure could the attention of the parliament, the municipalities, and the public be called. In no other work connected with the improvement of land is a general unity of action so absolutely necessary as in that which is now under discussion. Individual labor to a great extent is unavailing, if not assisted; but on the contrary, perhaps, counteracted by idleness, inactivity and neglect around. Well would it be then if the attention of our legislators could be enlisted for this subject, and as they have been sent to make laws for the general good, let them think for the thoughtless, force action upon the indolent, and compel the careless to provide as well for his own as the public good.

Let us now return to an earlier point in the discussion of our subject. A description has been given of what for a long time was the only method adopted for the carrying away of superfluous moisture. Is this method then effectual, or unattended by inconvenience or loss in its operation? In the heavier classes of soils which, on their reclamation from a state of nature, have become greatly consolidated and compressed below in course of cultivation, the water may perhaps be too soon and easily gathered in the water furrows, and led off before it has had time to sink into the impervious substratum; but in lighter soils a large portion of moisture will at once be absorbed beneath the surface, out of reach of the influence of the shallow water furrow, unless the soil has been previously charged with water, and then of course the superfluity must escape over the sur-

face. In the latter case this may be caused by the superficial strata being underlain by an impervious substratum, forming a barrier below which the moisture cannot penetrate, and that portion consequently becomes stagnant and can only escape by evaporation. Here are at once two conditions most detrimental to and destructive of vegetation. The well known effect of evaporation is the production of cold, or, rather, the removal of heat from the body which gives off its moisture by this means; and the most active stimulant of vegetable, as of all other growth is heat. It is indispensably necessary to decompose, and thereby prepare and assimilate for food, those matters which are contained in the soil and furnish nutriment to the plant, and also to promote an active circulation of the sap, by which alone a healthy condition can be maintained, and the body of the plant supplied with its sources of increase. By the retention and stagnation of water again, the earth becomes soured, and at the same time the pores of the soil being thus obstructed, and the air excluded from the roots of the crops, from all these united causes vegetation languishes or entirely ceases, decay ensues, and the sower is disappointed of the fruits of his labour.

In the instance of clay and the heavier soils, and whenever the water escapes over the surface, whether during periods of heavy rain or rapid thaw, the water becomes filled with the soluble portions of the soil, the more rapid its escape the more injurious its effects, the land becomes furrowed with deep irregular channels, through which are hurried into the ditch—ultimately, perhaps, to the main water course of the district, at any rate away from the field they were intended to enrich—many natural fertilizing substances, and, perhaps, also many which have been collected and incorporated by much care and labour with the soil.—In a climate like that in which we live, these effects are more particularly observable, in the spring of the year. The ground being thoroughly soaked by the autumnal rains, the frost takes a deeper and firmer hold on it, and many inches, in some cases it may be said feet, are thereby reduced to a solid and perfectly impenetrable substance. On the approach of spring the immediate surface passes into an almost liquid state, in consequence of no portion of the thawed snow or falling rain being able to penetrate the soil beneath, and if there be any chance for the flow of the water this destructive process commences, and the earth then loses its most valuable soluble ingredients. Besides the inconvenience produced by the accession of larger quantities of water than are immediately required, or are beneficial either by the fall of rains or from other temporary sources, another is met with by different strata of the earth coming irregularly to the surface, through which water is brought down from a higher level and perpetually oozes over the lower lands. To remedy all these evils different methods have from time to time been ingeniously devised for preventing this water from coming to the surface and by laying dry the earth to the depth of some feet, to leave an opportunity for the surface water to be conducted below at once instead of injuriously flowing over the top. These methods have been applied and attended with varying expense and success; but at last, in England, Scotland and Ireland, a system has grown up and been perfected, which seems to meet with universal approbation, and is now confidently adopted in all cases. I mean the system of deep drainage by pipe tiles. To describe the growth of this system, I can do no better than quote from an article on the "Progress of English Agriculture," which will be found in the *London Quarterly Review*, for April, 1858. The author says:—"Attempts to drain have been made from the earliest times. Specimens may be seen of very clever workmanship more than a hundred years old; but the when it should be done, and the why and the how, had never been reduced to rule. Lord Bacon, who had a large collection of works on agriculture, had them one day piled up in the court yard and set on fire, for, said he, 'In all these works I find no PRINCIPLES; they can, therefore,

be of no use to any man.' This was just the deficiency with respect to drainage, and it could not therefore progress until Josiah Parks, in 1843, expounded the 'principles,' and in 1845 made suggestions which led to the manufacture of the steel tools which were necessary for forming the deep cuttings, and the cheap pipes which were essential to carrying off the water from them when formed.—Up to 1843, little was done beyond tapping springs, or endeavouring to convey away the rain which fell on the surface, by drains so shallow that the plough frequently spoiled them, it being the popular belief that water would not penetrate through retentive clay beyond twenty or thirty inches. By experiments continued for several years, Mr. Parks found that a deep drain began to run after wet weather, not from the water above, but from the water rising from the subterranean accumulations below, and that by drawing away the stagnant moisture from the three or four feet of earth next the surface, it was rendered more friable, easier to work, more penetrable by the rain which then carried down air and manure, and much warmer and more suitable for the nourishment of the roots of crops. He came to the conclusion that the shallow draining advocated by Smith, of Deanston, was a vital error; and that four feet, which left a sufficient layer of dry warm surface earth, after allowing for the rise of the water by capillary attraction above the water level of the drain, should be the minimum depth.

"In 1843, at the Derby Show of the Royal Agricultural Society, John Read, a gardener by trade, a self-taught mechanic, exhibited cylindrical clay pipes with which he had been in the habit of draining the hot beds of his master.—His mode of constructing them was to wrap a lump of clay round a mandril and rub it smooth with a piece of flannel. Mr. Parks showed one of these pipes to Earl Spencer, saying, 'My Lord, with this pipe I will drain all England.'—The work from that time went rapidly forward. Drain-cutting implements were brought to perfection, and tile-making machines have been invented which now make pipes rapidly and cheaply. In 1846, Sir Robert Peel, whose management of his own property had made him thoroughly alive to the national importance of the subject, passed the act by which four millions sterling were appropriated towards assisting land owners with loans for draining their land, with leave to repay the advance by instalments extending over 22 years. Nearly the whole of the first loan was absorbed by canny Scotch proprietors, before Englishmen had made up their minds to take advantage of it. When it is remembered that the principle on which these results depend was not enunciated till 1843, it will be seen how rapid and mighty has been the recent progress in agriculture. A second public loan of four millions was granted in 1856, and it has been estimated that in the ten previous years upwards of sixteen millions had been invested by the nation, and by private companies and individuals in thorough drainage."

Knowing as we do the benefits and success of this system of drainage in England, and the other old countries, it will only remain to examine whether the same be adapted to the circumstances of this country, and I think it can be shown that where it is beneficial in milder climates, it is doubly so in ours.—What are the evils which we have specially to encounter? In the first place we are subject to loss by the young wheat plant, and even clover and other mature grasses, being thrown out in the early spring. This, I believe, to be entirely occasioned by the ground being at this season saturated with moisture, which renders it more susceptible of expansion and contraction by the alternate processes of freezing and thawing. Secondly, at present our damp and compact earth is frozen to such a depth, that before the frost is conquered by the warmth of spring, the surface is robbed of its riches by the rushing flow of water liberated by the thaw, but unable to find its way through the frozen mass beneath. Both of these evils would be cured by the soil being kept dry underneath, especially

if it were left well loosened in the autumn by proper cultivation, it being a matter of experience that dry soil loosely thrown together is much more impervious to frost than that which is left in a contrary condition, and at the same time, although the ground be frozen, yet if there is a way for the water to escape beneath, it assumes and retains a porous condition, which I have found in practice admits of a most perfect filtration of water through it. The next evil which the want of efficient drainage entails upon us is the length of time which elapses in the spring before the soil is dry enough to be usefully worked, or warm enough to promote vegetation. Before the plant attains any degree of strength during the temperate warmth of spring, so as to be able to push a vigorous root through the soil in search of nourishment, or expand a broad healthy leaf to be refreshed by the dew, the hot dry summer is upon it, checking its growth and bringing it to a hurried and imperfect maturity. By means of drainage, on the contrary, as soon as the snow and ice disappear and settled weather sets in, the ground would be in a state immediately to profit fully by the genial state of the atmosphere. This would lengthen the growing season of the year at least a fortnight, at a most important period, giving the young plants an early development, and ensuring them strength to pass through the subsequent stages of vegetation to a full and timely maturity. And it would not perhaps be a vain conjecture that we might thus escape the scourge with which we are at present threatened, namely, the wheat fly; for, if by this means our seasons could be advanced to the extent even of ten days, these and similar insects would not then be able to do the plant or the fast ripening seed any material damage. One more material advantage remains to be mentioned. The presence of water and moisture has a tendency to attract frost, and consequently in localities which are subject to these inconveniences, delicate crops which come to maturity at a late season of the year, such as Indian corn, potatoes and buckwheat, are constantly liable to serious damage from the early autumn frosts. This damage also would be ward-off by the removal of the origin of the evil.

We will now turn briefly to consider the practical work and expense by which the system is to be carried out, and the means by which, in a country where capital is deficient, we are to be enabled to apply it.

The general principles laid down for surface drainage will apply here. A proper outfall must be established, a main drain laid along the bottom of the field and branches run into it at regular distances throughout. The limits of a communication of this nature would not admit of my now referring to the great variety of circumstances, of position and quality of soil which necessarily alter the distribution of the drains. The details of a practical system of drainage would of itself form a subject for a separate paper. I now give an estimate of the cost at which the work can be done.

In England I have found that at a depth of four feet an average day's work is from five to seven rods, for which a price is paid of from 6d to 8d sterling, per rod, the latter price being the highest paid for digging in the very heavy stiff and tenacious wealden clays of Sussex and Oxfordshire. This includes opening and filling the drain, and laying the pipe. The price of the tiles varies according to the price of fuel and other circumstances, from 16 to 22 shillings per thousand, and the drains being generally laid at a depth of 4 feet, and 20 feet apart, (in Scotland in very heavy soils 3 feet deep, and 14 feet apart), the cost of draining will be from five to seven pounds sterling, per acre, or in our money from twenty-five to thirty-five dollars. In this country the work might be done at from thirty to forty dollars per acre. In England the daily wages of men engaged in this work are from 2s to 2s 6d stg., a day; and here if farmers were to provide work for their laborers all the year round instead of paying enormous wages in the summer, and none in the winter, a great part of this work might be done

at a no very great advance in prices, by taking proper precautions to enable it to be done in the winter. For instance, the plan of drainage might be laid out in the autumn, and the line of the drains covered with litter or manure, which will be useful in the field the following spring, and thus prevent the frost from impeding the work. The main difficulty in this matter is, that few persons, if any, have means to meet this very large outlay, and the only measure which I can conceive to remove it, is for our legislature to follow the example of the British Parliament, and pass an act to provide means to be placed at the disposal of every landholder for the accomplishment of this special purpose.

The provisions of the English Act 9 and 10, Vic. c. 101, can with very slight alterations, be made perfectly applicable to this country. The most important among them are the following. Any owner of land desiring to obtain a loan under the act, must make an application to the commissioners appointed for the purpose, containing a statement of the particulars of the land to be drained, of the manner of draining, of the estimated expense of the work, and of the estimated increase of the value of the land by the same, also the estate and interest of the applicant in the property, and whether the advance is to cover all or what portion of the expense of the work. If the application be entertained, the land, plan, estimate and specification of the proposed drainage, are to be inspected at the expense of the applicant, by an assistant commissioner, surveyor or engineer, and a report by them to be made and sent in with the plan and other documents accompanying the application, attached.

If the advance be deemed expedient, the commissioner is to issue a provisional certificate, that on the work being satisfactorily performed the advance asked for and approved of will be made, or, as the work proceeds, not over two-thirds of the sum actually expended.

This provisional certificate, however, cannot be issued until notice of the application has been duly published for two successive weeks, and two months have elapsed after the last publication, and in case any other person having any estate in or charge upon the land, sends in a dissent to the loan being made, no certificate can issue until the dissent be withdrawn, or an order be made in court, upon the matter being referred to the Master in Chancery to report whether it will be beneficial to all parties interested in the land that such advance be made.

The commissioners are to cause the work to be inspected, and all particulars of the execution and expense ascertained, and for this purpose may take declarations from any parties in any matter of enquiry under the act. Upon the issue of the advance in order to pay the debt, the land becomes subject to a rent-charge of six and a half per cent on the amount of the loan for twenty-two years, and a certificate of the advance is registered against the land.

This rent-charge has priority to all other charges upon the same land, and is collected half-yearly by the collectors of other land and assessed taxes for the several districts in which the lands are situated.

The out-falls for the drains are to be kept open and clear, and a yearly certificate of their condition is to be sent in to the commissioner.

Two objections have been urged against the propriety of the government of the country making any advance for this purpose. The first is the financial position of the Province, and the second the difficulty of ensuring the proper expenditure of the money, and afterwards of collecting the charge for re-payment. The first part of the latter difficulty is removed by the precaution of not paying the money until the work is done, which might be further strengthened by making it a penal offence to make a false declaration, and to draw any money under such false pretence, and the collection of the charge can be made equally regular and certain with that of the ordinary municipal taxes of the country.

Serious consideration will easily remove the first objection. The Province has not hesitated to incur a very large debt for the construction of our canals and railways, an immense proportion of the remuneration of which, is but indirect and speculative, in so far as they have very largely increased the value of our lands and of the products of them; but how will even this benefit be realized if no effort is made to stimulate and ensure the due improvement and cultivation of these lands, or their fertility be allowed to fall off, as has been gradually the case throughout this continent, and if the sudden failure of the last two harvests become a permanent affliction, and it should be remembered that this failure is not without its precedent—as witness the cases of Lower Canada, a great part of the Niagara District, and portions of the State of New York. On the other hand, the investment of money in the manner now proposed will undoubtedly bring its own return and reproduce itself. In the old countries where this system of underdraining has been so universally adopted, and forms the very basis of modern farming and of that enormous increase of prosperity of the agricultural interest which has accrued during the last few years, it is a matter of unquestioned profit, generally reckoned to be equal to twenty per cent. on the outlay when the land is properly managed afterwards, and in the case of lands highly cultivated draining has frequently been known to repay its expenses in a single season. The profits of draining in other instances have been estimated at thirty, forty and fifty per cent. on the outlay, the land having been increased in annual value to that extent, without greatly altering the former mode of culture; and when we see that a great part of the benefits of manure is lost where proper drainage is wanting, it becomes evident that the poorer the soil the greater will be the improvement of it by this means. It follows, therefore, that the adoption of a measure of this nature, instead of increasing the difficulties of our financial position, would but tend to relieve this Province from its present embarrassment; and the sale of Government debentures under a Canadian Drainage Act, instead of lowering our credit, would be hailed by English capitalists as an evidence of the earnest and enlightened attention paid by our legislators to the most vital and material interest of their country.

