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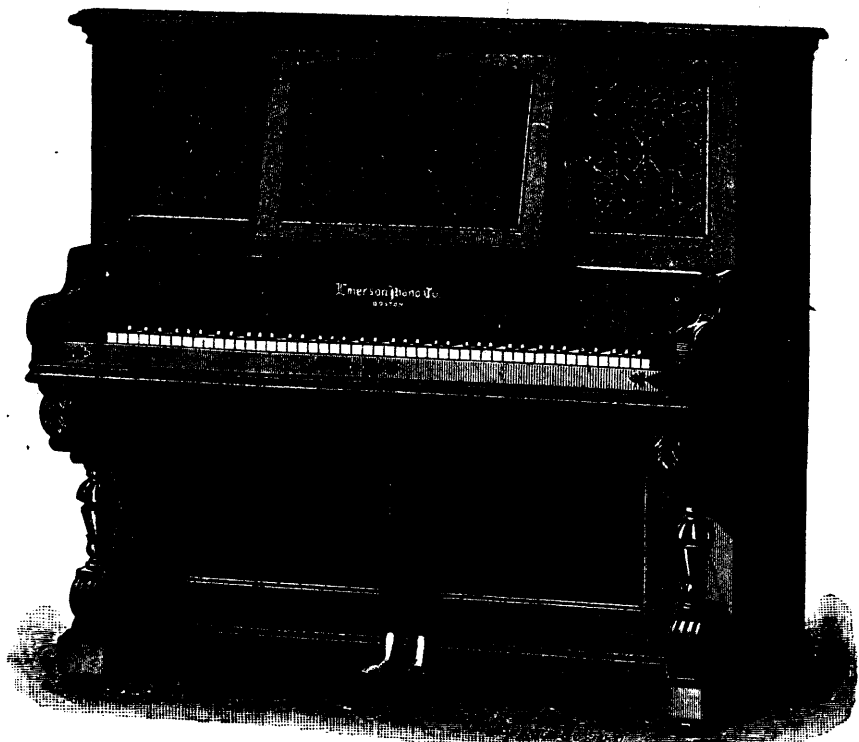
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### What every Farmer should Read.

The introduction of commercial fertilizers marks a new epoch in the history of agriculture. Their general acceptance in common farm practice is equivalent to a new force. They have revolutionized the mode of agriculture as thoroughly as steam and electricity has revolutionized transportation and commerce. A barren soil can be changed into one of exceptional productiveness through the judicious application of those elements of Plant Food which are wanting in it. Fields not only can be brought to their maximum producing power, but what is more still, they can be kept there, so that year after year abundant harvests may be removed from them; for, thanks to commercial fertilizers, what is withdrawn by one crop from the soil can now be replaced into it before the rising of the next, thus ensuring the conditions on the existence of which remunerative harvests depend. Acres which the plough had abandoned in hopeless despair have been again added to the area, on the products of which nations live and thrive and prosper. The tiller of the soil who, fifty years ago, earned by the sweat of his brow a scanty subsistence for himself and his family, returns to prosperity, if not to wealth. The self-same acres which hardly supplied food and raiment for the peasant proprietor and his children, now furnish him the means of educating his offspring, of purchasing improved agricultural implements, of adorning his home, of living in comfort at his fireside, and of laying aside, by thrifty management, a penny for rainy days. The marvellous ease and rapidity with which France paid off the enormous war indemnity of five millions of francs has justly taken the world by surprise. Yet, in a large measure, it was due only to the wealth which the sons of France knew how to derive from the land they live on, by a generous and intelligent method of farming. Nearly all European countries show a marked increase in the fertility of land worn out by centuries of cultivation, and often poor by nature.

To what else can this be ascribed, if not to a practical recognition of the value of artificial manures?

The importation of guano into Great Britain has increased from 2,881 tons in 1841, to 152,961 tons in 1861, while contemporaneous with it, grew up an enormous demand for superphosphates and other fertilizers, reaching an annual aggregate of 250,000 tons. These figures should convince the most skeptical mind that the phenomenal growth of this industry was caused by a no less phenomenal, though perfectly legitimate, demand on the part of the cultivators of the soil for its products.

In the United States the development of the fertilizer industry began at a later date than in Europe. The almost unlimited extent of territory in the North and North-West enable this country to draw resources which were not open to the densely populated countries of the Old World. Besides, the vast stretch of land brought for the first time under the ploughshare, was then possessed of almost boundless fertility, and gave at first enormous returns. Rich soil

placed there by nature, yielded very remunerative crops, and the necessity of parting with a policy of waste, incident to every new country, and of adopting one of strict economy in its stead, was not felt for some time. These and other reasons retarded somewhat the progress of scientific agriculture in this country. Nevertheless, the laws of demand and supply, with regard to the soil, apply here with the same inexorable force as everywhere else, and thus the day arrived when the New England States found themselves compelled to abandon the primitive ways of agriculture, which had exhausted the land for well-nigh two centuries, and to resort to a more rational, more intelligent, more scientific method of raising crops. Appropriating the accumulated experience of the European countries, the use of commercial fertilizers was there inaugurated, and soon spread over all States on the Atlantic seaboard, so that the consumption in 1875 has been estimated at over 100,000 tons of superphosphates alone. Since then rapid strides onward have been made, yet, as will be seen, much remains still to be done in that direction.

As far back as 1797 a recommendation of President Washington emphasizes the position which agriculture in this country occupied, in his estimate, in the following words: 'That the encouragement of agriculture is an object highly worthy of public attention, as it constitutes the most useful employment of our citizens, is the basis of manufactures and commerce, and is the richest source of national wealth and prosperity.' Again: 'On a view of the state of agriculture in the United States, it will be found that though it has made considerable progress in some parts, yet there are many important principles and valuable improvements, known and practised in other countries, to which most of the American farmers and planters are utter strangers. It may also with propriety be remarked, that the science of agriculture is in its infancy, and is susceptible of much greater improvement than it has yet received in any country. To introduce into our own the improvements of other countries, and to lay the foundation for discoveries which shall essentially contribute to the happiness of mankind, is an object worthy the attention of the legislature of a free people.'

Here is clearly expressed, with a strange foresight into the future, that the United States is, above all, an agricultural country, whose main resources lie in the broad acres scattered with such liberal profusion over the length and breadth of the land. The mineral wealth, great as it is, loses much of its significance when held up against the wealth for which no laborious and expensive digging down into the very bowels of the earth is required, but which can be gathered in profusion right on the surface.

It will thus be seen that abundant and remunerative crops are beyond question the main source of wealth and prosperity. They are the means of bringing the money of all nations into the country, to be reinvested in manufacture, in commerce, and in whatsoever promises a profitable employment for capital. A prosperous condition of agriculture is the condition without which no prosperity in manufacturing industries can last. What the harvest sucks from the willing bosom of mother-earth, that, and nothing else, constitutes in all countries, and at all times, the most solid, the most reliable, and the most unfailing, because the only true source of a nation's welfare and advance. However, it is not enough to give merely mental assent to the correctness of this universally recognized axiom; it is necessary to go further and to carry out

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in practice the injunctions which flow from it. From what has been said, the paramount importance of the maintenance of the fertility of the farming lands is evident. A rough glance at the marvellous increase in the production and exportation of cereals seems to convey the idea that a corresponding increase in the producing capacity of soil has taken place. But this is not the case. On the contrary, the area on which crops are being raised has been increased; but, speaking in general, the productiveness of the land has decreased. That the fertility of the soil, over large and productive areas of this country, has suffered appreciable diminution within the past decade, there can be little doubt. Carefully compiled statistics prove that the soils of the New England States, though they have been under cultivation for well nigh two hundred years, and though they were surpassed in natural productiveness by the rich virgin soils of the West, and showing an increased percentage of returns, while the latter become from year to year less productive. Now, it is very important to learn why this is so; and the plain reason is simply that a reckless way of farming is practised in the Western States; while the New England States, profiting by the lessons of European countries, have struck out upon a new method of farming, and take great pains to put into the ground the requisite amount of plant-food for each crop.

Nevertheless, there are not a few who believe that the farmers would be better off without commercial fertilizers than they are with them. To this opinion no stronger evidence to the contrary can be adduced than the fact that the most intelligent farmers began to use them in the first place, and have ever since continued to use them. And the supposition is perfectly preposterous and untenable that any farmer, with but a grain of common sense, will continue to use what proves to him not a source of profit but a source of loss. As it is possible to own treasures, and to waste them, nay, to throw them away, so it is not only possible, but, in individual instances, sometimes, no doubt true, that no benefit may accrue to a farmer from manufactured fertilizers. But, on investigation, it will always appear that the fault must be found with something else than with what he used. Commercial fertilizers do not pretend to be an absolute, an infallible guarantee for a remunerative harvest—an error which is not unfrequently entertained; for the preparation of the ground, the time of their application, the quantity in which they are applied, the season, whether wet or dry, propitious or unpropitious, and a variety of other causes, may neutralize the beneficial effects the elements of plant-food would not have failed to exert under more favourable circumstances. Commercial fertilizers possess only this value, that, judiciously applied, they make large and paying harvests possible, where these without them would be impossible. Their unquestioned merit consists in this, that they enable the farmer to derive profits from lands, even, which without them promise no return for the labour entailed by cultivation. And, as a matter of fact not unworthy of record, the cotton-growing region has been extended by their use fifty miles beyond the limit where it was considered possible to raise that staple. The negative testimony of many failures has therefore no weight when science, supported by the experience of European countries and by an overwhelming majority of intelligent, practical farmers, bears witness to the efficacy of, and the beneficial results derived from commercial fertilizers.

The trade in this indispensable necessity has demonstrated its right to exist, and it deserves fully the recognition which lately begins to be accorded to it. In every direction its work and influence have proved highly advantageous. Of offensive and dangerous matters it made willing servants for the common good; valueless articles acquired a value, and were added to the list of commercial commodities. Wherever the products of the trade obtained, large returns put money into the farmers' pocket, enriching not only the land, but, through it, the owner likewise.

It is, therefore, no exaggeration to say that the agriculture of the future depends upon the growth and development of the fertilizer trade. For it depends upon supplies of plant-food brought from sources outside the farm, and prepared for the farmers' use by those who make it their business to do so, and who must, in order to succeed, bring to it not only a large capital, but likewise science as a handmaid, skill, and business talent as absolute requisites. The progress of this industry measures the true progress of this country, and promises results which it is impossible to foresee at this day. It opens up a wide vista of changes and improvements. It heralds the awakening of agricultural thought, and has partly awakened it. And with thinking comes improvement, comes better tillage of the soil, comes better stock, comes larger crops, better profits, and lastly, a higher moral and intellectual standard.

The practical question to which each farmer or planter must frame his own answer may be summed up as follows: Whosoever enters upon the cultivation of land opens, as a matter of fact, an account with the ground he undertakes to till, as with a bank. When he takes possession of fields, either by purchase or inheritance or exchange, the ground contains certain deposits of phosphoric acid, of potash, or nitrogen, etc. The raising of every crop is practically making a draft upon these deposits. As banks do not honor drafts if the amount of credit does not equal the amount of the draft, so the ground is unable to honor the drafts unless the deposits enable it to do so. The more liberal the deposits made in bank, the greater the balance to the credit. So with fields. The more generous the supply of plant-food deposits, the greater can drafts be made in the way of expected harvests. Let no one suppose that Nature refuses to honor drafts. Nature knows not of stinginess: but it obeys simply the universal law, that it is necessary to have in order to be able to give, and that it is necessary to receive in order to be able to return. Nature is generous. Improve the land by fertilization, and the value returned by Nature invariably surpasses the value of the outlay to make the ground fertile.

**A Penny Saved is a Penny Earned.**—To incorporate daily a certain amount of fine ground phosphate of lime into the fresh barnyard manure by scattering it over the manure pile, or to compost them for some months previous to their designed application, is a universally indorsed practice. The good economy of applying these phosphates in a freely divided state to the compost heap has been illustrated again quite recently by Professor H. C. White of Georgia.

The compost heap was prepared of 40 parts of earth, 34 parts of fine ground phosphate and 31 parts of cotton-seed meal, and the mixture kept moist with water.

The compound was made in June, and tested

in February. A careful estimation proved that one-third of the phosphoric acid had been rendered soluble in soil water, the commercial value of the phosphoric acid had been increased not less than 46.4 per cent.

It is quite safe to assume that fine-ground Canadian phosphate of lime treated in a similar way with fresh horse manure or turf, and kept moist with urinary excretions, would have given even still higher pecuniary results.

Yet, with these facts before them, some farmers not educated, purchase superphosphates with the soluble phosphates, valued at 8 cents per pound by the experiment stations, when the insoluble phosphates by the same authorities are valued at 2 cents a pound, a difference of 400 per cent. which the farmer can save at the expense of a little time, and a very small amount of labour. A penny saved is a penny earned. A word to the wise is sufficient.

#### Home Use of Phosphate.

The feeling is growing on every hand that it is absurd to be exporting this richest of all fertilizers while our country is full of worn-out lands. Farms are constantly being abandoned in Ontario and Quebec, and families emigrate to a life of hardship in a western wilderness for the sake of newer soils, when knowledge of the means of enriching the old lands would preserve their homes in affluence. It is not a lack of the existence of knowledge either that is at fault, for the knowledge has been gained and many communities are profiting by it, but the fault lies in lack of zeal on the part of those who should be the people's instructors, and also in lack of enterprise by commercial men who might spread the education to their own profit. Now that experimental farms are being undertaken in Canada, it is to be hoped that no niggardly policy will prevent the widest distribution of information as to the results obtained. No subsidy or protective tariff can compare for a moment, as a means of benefiting the country, with a system that would promote the production from its lands. An increase in the fertility of the soil would add to the wealth of the country more than any conceivable number of manufacturing industries could do, and this result would be secured without robbery or injustice to any unprotected interest.

Georgia has been admitted to possess the poorest soil of any of the Southern States, and twenty years ago its worn-out lands could be bought for \$3 per acre. But knowledge of fertilizing has been extended and these same lands now command a market value of \$30 per acre, and the State now leads the South in the quantity and quality of its farm products, its cotton equalling that produced on the famous Red River bottoms of Louisiana. The same improvement could occur in the Province of Quebec.

The agricultural editor of the *Boston Post* says: "To incorporate daily a certain amount of fine ground phosphate of lime into the fresh barnyard manure, by scattering it over the manure pile, or to compost them for some months previous to their designed applica-

tion is a universally endorsed practice. The good economy of applying these phosphates in a finely divided state to the compost heap has been illustrated again quite recently by Prof. H. C. White, of Georgia." This gentleman put finely ground Carolina phosphate into a compost heap and after about half a year "a careful estimation proved that one-third of the phosphoric acid had been rendered insoluble in soil water. The commercial value of the phosphoric acid had been increased not less than 46.4 per cent."

Many United States farmers now keep finely ground phosphate constantly on hand, and daily spread it in the stables and stalls to absorb the urinary excretions and become mixed with the manure. A most valuable fertilizer is thus secured at a small expense. Here is this natural fertilizer placed by nature at our doors, and we are not sufficiently intelligent or enterprising to make use of it. A great opportunity exists in this direction for both the philanthropist and the capitalist to work, and secure the blessing due to him "who makes two blades of grass grow where only one grew before." The Department of Agriculture and the Agricultural Societies should spread information about commercial fertilizers, and some wide-awake men should seize the opportunity to prepare and sell them in Canada.

This is a most important matter for our miners, as well as for our farmers, and we are fully justified in calling attention to it in these columns. Every pound of phosphate that can be mined in Canada is needed on her own soil, and should be sold here instead of being transported thousands of miles and often sacrificed in competition with inferior foreign products, or through losses by those "tricks of trade" that are so notable a feature of modern commerce.

#### Raw Phosphates.

Previous to the year 1770 it is difficult to find any record of the use of bones for agricultural purposes. In 1740 their value for a top-dressing for grass lands was accidentally discovered at Sheffield, where a heap of bone shavings, scrapings, &c., was buried in a field with marvellous results. The mechanical division of bones in their raw state was difficult, and so costly that it precluded their use in any other form than crushed. Liebig, some fifty years ago, found that by the application of sulphuric acid to bones it reduced them to a finer state of division than could be done by then known mechanical means. This application is often called dissolving bone in acid. There is no clear solution. It is a mere breaking up, it is a softening, pap-forming process, and bone in this state would more appropriately be called bone pap. The bone is merely so far reduced that, when rubbed between the thumb and finger, no grit is felt. Bone cannot all dissolve, for the sulphuric acid, when added rightly, unites with the lime of carbonate and phosphate, and forms with that insoluble sul-

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plate of lime or plaster. It is this which gives the grayish-white look to the bone porridge. At the present time comparatively few bones are used for fertilizing purposes; phosphate rock, phosphorite, apatite and coprolites having been substituted generally in place of bones in manufactured superphosphates and commercial fertilizers. Where originally it was impossible to get raw bones ground fine by machinery, that difficulty does not exist with phosphate rock, phosphorite, apatite and coprolites, as they are all easily reduced to an impalpable powder at a low cost with the present machinery now in use, and it has been found by repeated experiments by competent authorities that if the phosphates are ground to an impalpable powder, they are as available to crops as if they had been treated with sulphuric acid, the carbonic acid of the soil and the soil water being as efficient a solvent as the sulphuric acid. In saying that phosphoric acid is insoluble it is meant that it is insoluble in pure or distilled water. Water which contains carbonic acid, ammonia, or common salt (and all water contains one or more of these), has the power of liberating the phosphoric acid from its base lime and rendering it available to roots. The action is slow, but it is sufficient, and it is more rapid the finer pulverization of the phosphate. In fact, phosphates treated with sulphuric acid, to render them insoluble before, but not after they are applied to the soil and sold under the name of superphosphate, when applied to the soil reverts or goes back to its original condition; this is generally admitted, but it is soluble in the acids of the soil in the same manner as are the phosphates ground to an impalpable powder. It is estimated that 400,000 tons of sulphuric acid, 50° strength, are used annually in the United States to convert insoluble phosphoric acid into soluble phosphoric acid, and that this quantity will be doubled during the next five years. As it requires about a ton of sulphuric acid of this strength for every ton of phosphate rock containing sixty per cent. of phosphate of lime, it is readily seen that the sulphuric acid will cost more than the phosphate of lime, and reducing the quantity of phosphoric acid in the resulting superphosphate one-half. Certainly this is a most costly way for the farmer to obtain the phosphate of lime, finely divided so that the acids of the soil can act upon it. The present machinery in use is by far the cheapest method, for in addition to the great cost of the sulphuric acid, and the necessary expenses attending its use, there comes the expenses of transportation, which has been doubled by the addition of the sulphuric acid. It is claimed by some that for tilled and quick growing crops (it is conceded that it will for grass and winter grains) the phosphoric acid will not be liberated as fast as the crops require it from the phosphate when in an impalpable powder; but there can be applied at the same cost four times the quantity of phosphoric acid in phosphate of lime in an impalpable powder, than there can be

in phosphate of lime treated with sulphuric acid, and there can be no question but that with using four times the quantity as much phosphoric acid, if not more, will be as available for the growing crops as if one-quarter part was used that had been treated with sulphuric acid; again, the additional three-quarters used is not lost, but becomes assimilated in the soil for the drafts of future crops upon it. But we are not confined to the use of sulphuric acid or the slower operations of nature to render the phosphoric acid in phosphate of lime immediately available for crops. It has long been known that fermenting manure or peat with phosphate of lime powder scattered or mixed through it would render the phosphoric acid at once available. This certainly is a better as well as a cheaper way for the farmer to procure soluble phosphoric acid, than to get it in phosphate of lime, treated with sulphuric acid at four times its first cost and the expenses for transportation doubled. The theory of scientific agriculture is based upon a complete knowledge of soils, plants, animals, and manures, and it is evident that until these elements are thoroughly understood, no attempts at improvement or plans for increased production can possibly be successful. The manure question is the most important one connected with agriculture or horticulture. With fine ground phosphates as the basis of operations, we can now obtain complete manures for any culture, made according to any formula, and containing in a readily assimilable form all the ingredients called for.

**Ottawa as a Mining Centre.**

It has been predicted that with the waste which for many years has been taking place in cutting and preparing timber in our forests, and from the want of any systematized forestry regulations, the time is not very far distant when the lumber trade of Ottawa will shrink into very small proportions from the want of material, and that the large and costly establishments now employing, in this vicinity, so much labour and capital will materially curtail their operations, and practically suspend work on a large scale. The question which naturally arises is, how will Ottawa be affected by such a result? The country surrounding the Capital is not an agricultural district compared with Western Ontario, and manufactures are only in their infancy. But just at the very time when this apparently bad outlook looms up, a new industry appears and is assuming such proportions that there is every reason to believe it will, before many years elapse, become the leading enterprise of central Canada, and afford employment for hundreds of busy hands. This industry is mining and utilizing the product of the mine. The whole country north of Ottawa, wherever the Laurentian range of mountains is met with, possesses mineral wealth of one kind or another. Iron, plumbago, galena or lead, phosphate or apatite, asbestos and mica, all are there, and in rich profusion. Few persons, beyond those engaged in

mining enterprises, are aware of the richness of this section, and the wealth that has been lying at our very doors for years past, waiting only the hand of man for development. It is of untold value. The plumbago mines at Buckingham, a few years ago, gave every promise of becoming one of the largest industries in Central Canada, but mismanagement and waste curtailed their operations, and the large crushing mill on Donaldson's Lake being destroyed in the great bush fires which swept that section of the country, crippled that industry for the time being. These works, however, are now to be utilized again, and the yield of the mineral is of so pure a quality and so easy of access that the only wonder is that they have not commenced operations before. The enormous proportions the phosphate industry has assumed are well known both in Europe and at home here, and United States capitalists are investing largely in phosphate lands and phosphate operations. Not only, as at first, is the mineral mined and shipped, but crushing and pulverizing works are now in operation, and a demand for ground phosphate has arisen amongst the fertilizer companies on the shores of Lake Erie, and elsewhere, which bids fair to shortly revolutionize the trade in rock phosphate by shipping only the ground material. Water power is the only cheap motor for works of this nature, and the mighty power of the Chaudiere Falls, which hitherto has been confined to the manufacture of forest products, will contribute its share to the development of mineral wealth as well. The iron deposits which abound in this vicinity will prove as valuable in the near future as the gold-bearing quartz in the lands where the latter is worked. The iron of this district is known abroad for its excellent qualities, comparing as it does with the finest Sheffield steel, and one mine alone, in the townships of Templeton and Hull, is estimated by Professor Chapman to contain 6,300,000 tons, equal to a daily output of 100 tons of ore, or 60 tons of metal, during a period of a century and a half.

The iron deposits in Bristol are also now a centre of attraction, a number of capitalists having taken them in hand, and the only requisite to perfect a large iron trade in our midst are smelting works, which time will certainly bring about. Taking into consideration these facts, he who reads the future will see visions of mining industries and their attendant factories supplanting the timber trade, when forest products will require to be handled miles away from their present location. As the demand for timber yearly drives the lumberman further and further up the head waters of the Ottawa and its tributaries, the mills will have to be located nearer to the place of production, and railway facilities for the transport of spruce timber and deals now penetrate the lumber district to such an extent, that the material loaded on the cars for Quebec now passes by Ottawa in transit, instead of as formerly being floated here as a distributing point, where it could be rafted or

sawn and shipped in its manufactured state. Where is the rafting that only a few years ago filled the bay below Parliament Hill with its industry? Where are the raftsmen whose stalwart forms filled Sussex street and Lower Town during the summer months? Gone with the advance of railways to other points which demand them. But the miner is gradually filling their place, and although his presence is not yet felt to any extent in the streets, yet we think the banks could tell us something of the large transactions done with him, and of the heavy drafts the pay roll of the mines requires monthly. The settlers on the Lievre and Gatineau who were virtually in the power of the large lumber firms, and who sold their produce to those firms for whatever they could get, are fast acquiring money from the demand the mines make for farm produce of all kinds; and this not for one firm only, but the competitive demand of the various mines enables the producer to ask and obtain a fair value for his hay, his roots, and produce generally. To the mining industries must Ottawa look in the near future for its trade, and although lumber has done much to build up the manufacturing industries of the Capital, mining will do still more, and be a permanent source of wealth when the pine tree will be as scarce in the Ottawa district as it now is in Western Ontario.

#### The Phosphate Trade of Canada.

Revised from Vol. V., No. 6, of THE CANADIAN MINING REVIEW.

There are probably very few persons beyond those interested in the industry who know what Apatite is, or to what uses it is applied, and when they are told that the shipments of crude rock in 1877 reached the large amount of 23,600 tons, or an estimated value of \$319,815, and that they are annually increasing, they will naturally seek some information respecting it. Apatite is the crystalline form of phosphate of lime, used largely for the manufacture of superphosphates when treated with sulphuric acid. It is only within the last few years that attention has been given to its existence in Canada, although the late Sir William Logan cites its existence in certain localities. Specimens of it, and very pretty they look in a cabinet, might have been seen in museums or in private collections, but the great wealth it would bring to the country was little thought of, and mining it on any large scale would, till quite recently, have been looked upon as a waste of money. To-day, however, it is taking its place as one of the foremost industries in Canadian mining, and with the exercise of care and judgment apatite mining affords a handsome return to those who engage in it. This industry, moreover, adds to the general wealth of the country, by the circulation of money in the purchase of agricultural products to feed the miners, for boats and railways transporting it to the seaboard for shipment, to the vessels which carry it across the Atlantic, and to the brokers and commission merchants who handle it before it reaches its British purchasers.

Prof. Boyd Dawkins, an eminent geologist, who, when in America with the British Association, visited the Ottawa County mines, stated in a paper read by him at Manchester, on his

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return, that in his opinion phosphate was "one of the most important resources of Canada."

When Liebig, in the year 1840, compelled the agricultural community to accept his views of exhaustion and restoration of the soil, and that the constant removal therefrom in the harvest of the inorganic elements of plant food, notwithstanding the rotation of crops and the old system of manuring, was a robbery of the soil, which enriched the present at the expense of the future, he may be said to have been the founder of an industry which has assumed constantly increasing proportions ever since. That industry is the manufacture of fertilizers or superphosphates, and the demand for materials from which these can be manufactured led to a search for, and consequent working of, natural deposits in which phosphate of lime preponderated. It is not our intention to go into the question of fertilizers further than to state *en passant* that in supplying the nutritive elements of plants in the form most favourable for absorption and assimilation, the whole art of manuring consists, and that as ordinary manure does not always contain the two most important inorganic elements of plant food, phosphoric acid and potash, sufficient for plant use, the needs of mankind demand the employment of artificial fertilizers along with or as a substitute for farm-yard manure.

Dr. Dawson, the assistant-director of the Geological Survey of Canada, in a paper read by him before the Ottawa Field Naturalists' Club, in 1884, reviewed very concisely how phosphorous was essential to all living tissues whether vegetable or animal, and in following the transmission of that substance from the soil to the plant, from the plant to the animal, and from the animal again to the soil, he further pointed out that this cycle of nature is interfered with and broken by the massing of population in large towns where the phosphates and other substances valuable to agriculture are lost. He also cited statistics of the amount of phosphorous actually contained in the grain annually shipped from the port of Montreal, estimating it for this purpose in the form of phosphoric acid. Wheat contains eight-tenths per cent. of this, or about sixteen pounds to the ton, and a very little calculation will show annually the enormous amount carried away, and a still further calculation, based on the average quantity (about two-tenths per cent.) contained in ordinary soils, gives the amount of phosphate of lime required to restore and maintain the fertility of the fields. With these statistics the necessity is evident of having sources of supply of phosphates, the most available of which are concentrated natural deposits. The questions that follow are: What is the nature of them? Where do they occur? How have they been formed?

To the first of these questions let us take Dr. Dawson's own words. "The concentration of phosphates in nature is generally found to have been brought about by organic agency," and he then cites as the first example guanos, composed essentially of the excrements of seabirds. These are divided into two classes, nitrogenous and phosphatic. In the former, which belongs exceptionally to dry climates, the organic matter, converted by decomposition into ammonia salts, remains as part of the mass, but in the latter the rain has removed the soluble ammonia, leaving the phosphatic matter. This is the case with the West Indian guano, and the coral rock, penetrated with hollows and fissures, has become so permeated with phosphatic accumulations that it is known as phosphatic rock. The deposits in the South of France, known as

Bordeaux phosphates, are looked upon as of a similar origin, the higher parts, the plateaus of Jurassic limestone in which it is found appearing to have formed at one time an archipelago in a tertiary sea, like the West Indian Islands of our own time. This phosphate rock, however, is of very modern origin geologically speaking. Coprolite beds, such as the phosphate rock of South Carolina, have their origin in a different source, and are traceable to the accumulations in shallow tidal estuaries of ancient seas, of molluscs, bones and other marine organisms massed together by concretionary action, and forming layers similar to the well-known mussel beds on many parts of our sea coasts to-day. But the expression coprolite, applied as it is to Carolina phosphate, is erroneous. It should only be applied to the fossil excrements of various animals, notably the saurian monsters of the antediluvian shores, and which are so abundant in the eastern counties of England that coprolite pits have been worked there for many years. Crystalline phosphate or apatite is new, different in appearance from the preceding, and Dr. Dawson remarks, speaking of it, that in the Laurentian rocks of Canada are sediments deposited in the earliest seas of which we have any trace, but which originally resembling those of later seas, have been so completely altered that their materials have entered into new combinations, and have by igneous action become entirely crystalline, resembling now the original deposits as little as do the crude ingredients of glass the finished product. In substantiation of this theory limestones thus acted on would assume the crystalline character of marble, beds of a peaty or coaly nature would pass into graphite or plumbago (crystalline carbon), and phosphatic layers would appear as crystalline calcic phosphate or apatite. All these substances are found in contiguous zones or belts in the Laurentian rocks near Ottawa, an evidence pointing directly to the correctness of this theory. The greatly disturbed character of these rocks explains the irregularity of their deposits, as layers which, before the great folding and kneading together caused by igneous and volcanic disturbances may have possessed regularity and uniformity, have been so dislocated and upset as to lead to the production of large pockets and irregular masses, connected only by narrow and twisted seams, so narrow sometimes as to appear as isolated portions.

The principal sources of supply may be stated as follows:—The West Indies and other islands of the Caribbean Sea, supplying what is known to the trade as Sombrero phosphate, or rock guano as it is sometimes called, of high quality; Navassa, from its impurities can only be used for a lower grade of superphosphate; Maracaibo, or Mark's Island, is of very high quality; St. Martin's Island, of good quality; Araba Island yields a variable quality, and Pedro Keys and other small islands yield an uncertain supply. In the Pacific Ocean, Baker, Jarvis, Howland, Malden and Starbuck islands afford a high-class rock guano. In the South of France the Ardennes region affords what is known as Bordeaux phosphate, so called from the port from whence it is chiefly shipped. The valley of Lahn, in Nassau, yields what is known as German phosphate. The eastern counties of England, Cambridgeshire, Bedfordshire and Suffolk, produce coprolite of high quality. Boulogne, in France, yields coprolite, used largely for mixing with materials of a higher grade. South Carolina, in the United States, produces large quantities of phosphate known



as Charleston rock, of a low grade, but very largely used, its composition being easily attacked by acid.

Crystalline phosphate of lime or apatite, the purest form which is at the manufacturer's disposal, is now becoming more and more sought after owing to its high percentage and greater purity, and Canada will, from present appearances, be the chief source of supply. Norway furnishes an excellent quality of this material, but the supply is limited. Spain produces large quantities of apatite, and in Extremadura and the neighbouring districts of Portugal large deposits have been known to exist for some years, but have only recently been worked to any extent. The above-mentioned places are the only known sources whence apatite is obtainable, and as a consequence the great value it assumes from its limited sources of supply must be at once apparent.

In his report on the County of Hastings, in the Province of Ontario, in 1871, Mr. Venmor, late of the Geological Survey staff, called attention to large deposits of apatite existing there that had been quarried on and off for over 20 years. The richest of these occur in the township of North Burgess, where a number of "openings" were worked with fair returns. These deposits he named respectively "the North Burgess Basin," and "Bedford, Storrington and Loughboro Basin." Analysis of specimens taken from these in different localities gave as an average 88 per cent. of phosphate of lime. The mineral has now been discovered more or less all through the district lying north of Kingston and Belleville, and although mining is now carried on there on scientific principles, it is as yet in its infancy as far as that part of the country is concerned.

The Laurentian Mountains of the Province of Quebec seem to offer greater advantages than elsewhere for this species of mining, especially in the district lying northeast of Ottawa and within a radius of 30 miles from the Capital. This Laurentian range meets the eye when ascending the river St. Lawrence from the sea, and runs parallel to it on the north shore, and diverging somewhat east of the confluence of the Ottawa River, follows the coast of the latter westward by north, sending a spur across it near Portage du Fort, which penetrates the Kingston district alluded to before. The natural formation of these mountains is far from being conducive to agriculture, the country presenting a succession of small isolated, rounded, rocky hills, alternating with numerous lake basins. The rocks, though concealed in the valleys by considerable depths of alluvial soil, are seen in the hills to be hard and undecayed. After the first growth, which covers these hills in a state of nature, has been cut, the undergrowth is apt to be destroyed by fire, and the comparatively thin layer of soil is laid bare, which, being soon washed away by the rains, exposes the rock and renders the region sterile. With the exception of straggling settlers here and there in the valleys, all this district had been left as valueless till the discovery of the presence of apatite brought it into notice, and land, which was held by the Crown at 30 cents an acre, was bought up by speculators, and realized fabulous prices for mining purposes. The latter is carried on principally in the townships of Buckingham, Templeton, Wakefield, Hull, Derry, Portland, and Bowman, the two former being the chief fields of present operations. Exploration shows that apatite is to be found in a much wider district than the above mentioned, the zone containing it running in a north-easterly direc-

tion from the Blanche River across the river Lievre into the adjoining country east, and then taking a curve backwards in a north-westerly course. The belt is very productive and yields a very fine quality of apatite.

Dr. Sterry Hunt, who has made a persistent study of the Laurentian rocks for upwards of thirty years, says the question of the continuity of the deposits is important. Veins fitting fissures in the rocks are sometimes continuous for great lengths and to great depths, but their extent varies. Inclined beds of the material, which once were horizontal sheets inclosed in strata that have since been folded or convoluted, should be as persistent in depth as in length and when traced in the outcrop for hundreds of feet may be expected to continue downwards as far, unless a turn of the enclosing strata brings them up again to the surface. He urges, therefore, deep mining for permanent success, and the experience of the past couple of years proves the correctness of his theory.

Up to 1886 the majority of the workings were superficial, consisting rather of shallow pits or large quarries. The reason for this is traceable to the fact that apatite in its crude state finds a ready sale at all times, even in small lots of five or ten tons. Consequently farmers and others opened pits and trenches for the purpose of extracting what mineral was within easy reach, and with satisfactory results, but so soon as the opening attained a depth at which work became difficult from the want of appliances for hoisting, or from the inflow of surface water, the pit was abandoned for a fresh outcrop close by, and the same process was repeated. The very abundance and value of the mineral thus led to its careless and wasteful handling, and retarded for some time its legitimate growth. With the advent of capital matters assumed a different aspect, and the old unbusinesslike system of mining which characterized the first attempts in the Ottawa district has been abandoned, and deep mining is now engaged in with great promise of abundant returns. The investment of foreign capital, and the organization of powerful companies composed of men of practical business ability and intelligence, together with the introduction of steam power and improved machinery, economy in the management of the mines and the necessity of shipping only a high grade of purity, have now placed these works on a sound and permanent basis. One American company has sunk a shaft on their property to a depth of over 600 feet, passing through several deposits of pure phosphate and following the connecting vein which narrowed at certain depths to no greater thickness than a man's thumb. At this depth they struck a productive deposit on which they have continued working, running drifts laterally, and turning out a large yield of apatite of high standard.

The great advantage the Buckingham mines possess is their contiguity to navigable waters, the mines in the majority of cases being situated near the River Lievres. This is a slow, sluggish stream, very deep and only at one point in its course (known as the Little Rapids) where boulders occur and a ledge of rocks crosses the channel, is any obstruction offered to navigation. This is at present obviated by the use of flat bottomed scows carrying the apatite, being towed to the head of the rapids by a small steamer, where they are let loose to float over it, much in the same way as cribs of timber are sent over the Ottawa "slides," or over the rapids of the Ottawa and St. Lawrence rivers. At the foot of the rapids the scows are taken in tow by another steamer which tows them to a landing



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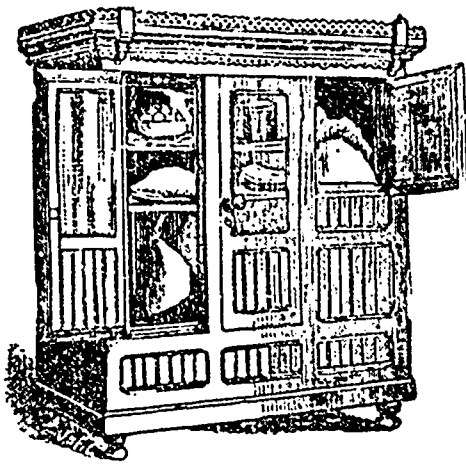
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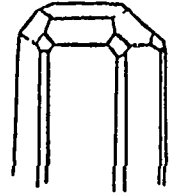
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at Buckingham Village, where a short branch line of the Canadian Pacific Railway has trucks waiting alongside the river, into which the mineral is transferred, and conveyed thence direct by rail to Montreal, where the cars on arrival, traversing the line of docks, run alongside the vessel which is to receive their contents. The Government, recognizing the rapid growth and increasing importance of the industry, has at present under construction a large Lock and Dam, which, when completed, will obviate this difficulty and greatly facilitate the transportation of the ore, at the same time enabling the miners to handle their output at a minimum. The cost of floating the mineral down the river ranges from 30 to 50 cents, according to distance, the freight by rail to Montreal costs about one dollar and twenty five cents per ton. Ocean freight ranges from three shillings to seven and six pence sterling, although there are times when from want of freight vessels will carry the mineral as ballast free of charge. The value of the crude material in Liverpool ranges from eighteen to twenty dollars, and from these figures it is easy to see what a profit there is in prosecuting this industry. But it is only by the outlay of large capital in developing and getting operations into thorough working order that this end is attained. The first year seldom leaves any margin, owing to the heavy outlay for plant, buildings, etc. But in the case of two companies, at least, one English and the other American, it is known that after the first year's outlay a large dividend was declared and paid to the shareholders.

Care has to be taken that the quality shipped is of a proper standard, and not mixed grades. The qualities are known to the trade as firsts, seconds and thirds. The best quality averages from 80 to 88 per cent. of tribassic phosphate of lime, the general run of the apatite shipped ranging from 75 to 85 per cent. The present basis of value for 80 per cent. mineral is about 11d. per unit, with a rise of one-fifth of a penny for each additional unit. To secure an even grade, dressing is resorted to under the name of "cobbing." This is necessitated by the intrusion of mica, pyrites, pyroxene, and carbonate of lime, all useless materials which have to be got rid of, except where large masses of pure apatite have been brought to the surface. Cobbing consists of the separation by hammers and hand picking,—an easy operation owing to the softness of the apatite as compared with extraneous substances—in a building known as a cobbing house partly open at the sides. On one side of this, through or around the interior of which solid tables or stands are located, are empty tram-cars or waggons, into one of which the refuse is thrown as broken off, whilst the apatite thus cleared is thrown into another receptacle on the other side. Boys and old men are employed at this work, and they earn from 50 to 75 cents per day, being paid mostly by piece work. This process has been greatly facilitated by the recent introduction of revolving screens, jigs, and other improved machinery, now adopted by all the leading mines.

The various forms in which the apatite of the Ottawa district presents itself are in crystals, sometimes of very large dimensions, in masses varying from compact to coarse granular; in strata of a lamellar texture, and in a friable variety which is abundant, known as sugar phosphate. Phosphate crystals consist of six sided prisms with complete pyramidal terminations, though often possessing one pyramidal termination and one basal plane. In size they vary greatly, viz: from those of less than half of an inch in length and corresponding thickness,

weighing only a portion of an ounce, to those of many hundredweights. A large and almost perfectly formed crystal from the Little Rapids mine may be seen in the collection of the Geological Survey's Museum at Ottawa.



The usual color of crystals is green. Some, however, approach white, while others are of a pink, yellow or violet tint, and others nearly black. The color appears to be purely accidental and is due to various impurities mechanically mixed with the minerals. Thus the red and brown varieties contain minute crystals of hematite; the blue and green, scales of chlorite; and the yellow and blue owe their tints to organic substances.

Having now given an idea of what apatite is, and of the Ottawa district in which it is worked, it may be well to describe some of the larger mines in that locality. The Emerald Mine, one of the earliest opened, has been one of the most productive, and is worked on thoroughly scientific principles. It is situated some 9 miles from Buckingham Village, is owned by the Ottawa Phosphate Company, and has changed hands several times, each succeeding purchaser paying higher prices, the last sale clearing the owners over \$50,000, before any large works such as are now carried on there were undertaken. Drifts are now in the side of the hill to the main shaft, by means of which the refuse as well as the mineral are run out on tramways. The Little Rapids Mine is a very valuable property, some 3 miles north of the previous mine. A large number of openings have been made on the property, all of which have yielded very good returns. Several deep shafts, two of them extending to a depth of over 200 feet each, have been sunk and drifting carried on at various levels with great success. This mine is owned by Mr. W. A. Allan, of Ottawa. It is well equipped with the latest and most improved machinery. A well constructed tramline from the pit's mouth to the river landing was built last year. The North Star Mines, owned by an American company, contiguous to the previous mine, is yielding good returns for the outlay on them, and it is here that the deep shaft of 600 feet, previously mentioned, has been sunk. All the above mentioned mines lie on the eastern bank of the Lievres. Some 8 miles further up, on the left or western bank, are to be found the High Rock Mines. These are probably the most extensive of all, and belong to the Phosphate of Lime Company, of London, England, under the management of Mr. W. W. Pickford. The property owned by this company covers 1,200 acres. The profits of the three years, 1882-3-4, were sufficient to cover all the outlay and to admit of a dividend of 25 per cent. on the capital stock, besides setting apart \$10,000 as a reserve. The principal operations are conducted in their large No. 11 tunnel, and as an instance of the abundance of this mineral in the workings at this point, it may be said that no later than on the 11th of June last, 55 tons of high grade ore were taken out from one blast. At present the yield is richer than at any previous time since the mines were first operated. A large number of openings are also being worked on different portions of the property. The annual output from these richly productive mines may be fairly stated as at 7,000 tons per

annum. Tramways along the face of the mountain, on which these works are situated, carry the refuse to points where it is easily dumped into ravines and so away from the site of any probable future openings. The offices, and buildings for the miners' accommodation, are scrupulously looked after, and the company has provided a reading room well supplied with books, papers and periodicals for their employees' use when not working. The mountain is some 1,000 feet above the sea level, and the view is very fine, the Laurentian hills in all directions rising one above the other till lost in the blue haze of the distance, whilst at the foot of the mountain is a natural beaver meadow, fringed with trees, and nestling as it does amongst the mountains gives an air of quiet and repose in contrast to the busy scene of the works going on above it. The number of men employed by this company ranges from 100 to 150. The Canadian Company's Mines adjoin those owned by the High Rock people. This company was organized in London in the beginning of the present year, with a capital of 110,000 shares at £1 each, and now operates the property formerly worked by the Union Company of New York. The property includes some 1,285 acres, and embraces the Star Hill, Williams and Ruby mines. The latest machinery and the most modern appliances are used; many new buildings have been erected, including a large cobling house, with revolving screens; and a wire rope tramway from the pit to the landing is at present under construction. The escapement which forms the walls of this ravine shows the course of numerous veins of the mineral all trending eastward and running into the mountain, and the main works are carried on by literally quarrying the hill side, and cutting it away in solid masses. Three years ago on the site of the Canadian Company's mines there was nothing but rock and unbroken forest: to-day there are numerous dwellings, substantial offices and storerooms, tramways and good roads. The number of men employed here ranges from 100 to 125.

There are numerous other mines being worked all through the apatite district, especially in Templeton, where both Canadian and American capitalists are interested, and new mines are being opened. In the Templeton district may be mentioned the celebrated Blackburn Mine, the oldest and most productive in this section, the Templeton and Blanche River Company, the Canada Industrial Company, the Anglo-Canadian Company, and Mr. Jackson Rae's mines. Extensive operations are also carried on at the Otty Lake Mines, in Perth; by Mr. James Foxton and others at Sydenham; and also by Captain Boyd Smith and others in the Kingston district. The description given of the mines above mentioned, however, shows sufficiently the magnitude of the various enterprises.

The following table of shipments, for each calendar year respectively, from Montreal, of crude Canadian apatite as used in the manufacture of superphosphate abroad, gives a fair idea of the yield of the mines of the Ottawa district, as the greater portion of it is derived from them, the Kingston district only furnishing a comparatively small yearly amount.

1880.....	7,500 tons.
1881.....	10,307 "
1882.....	15,556 "
1883.....	17,160 "
1884.....	20,461 "
1885.....	21,876 "
1886.....	19,345 "
1887.....	20,349 "

The question may naturally arise why such a

commodity should be sent abroad to be manufactured when apparently it could be treated here and shipped in a condition ready for use, thus adding to our own industries. The reason for this, however, becomes obvious when we ascertain that the pyrites, out of which the acid for dissolving the apatite is not found in quantities sufficient to supply works on any scale within any reasonable distance of the mines. The cost of transport of the crude mineral to Europe, where, from the numerous chemical works existing, acid can be purchased far cheaper than it could be made here. Again our Canadian apatite enters largely into competition with a lower grade phosphate from other quarters in the superphosphate works across the Atlantic. When a demand shall have arisen amongst our own farmers to compensate by the use of phosphatic fertilizers the soil for the loss it undergoes by the constant removal of crops, especially in districts where cattle raising is not largely carried on, superphosphate works may be started with a show of success, in spite of all difficulties. In his Report for 1883 the Minister of Agriculture remarks:—"experience goes to prove that for the production of cereals of every description as well as for the strengthening and renewal of worn-out lands, no available fertilizer is known that can produce such beneficial results as phosphate when subjected to a chemical process."

A curious feature in the apatite trade of Canada is that, although a very large amount of American capital is invested in our mines, almost the whole of their product finds its way to Great Britain, and that a large amount both of crude and manufactured phosphate is exported thence to the United States. There is every reason to believe that both these articles are Canadian produce reshipped, and the explanation given for this by Mr. Tourance, late of the Geological Survey staff, is that it is simply due to the conservatism of trade, as American dealers were in the habit of importing from Britain long before our Canadian deposits were worked, no efforts have since then been made to direct from here into fresh channels a trade which was commenced with the English market by men more familiar with that than with the American.

A wealthy American company commenced operations last year at the junction of the Lievres and Ottawa rivers for grinding and pulverizing crude phosphate, either for acid treatment or for use in the pulverized state. These works are capable of grinding 50 tons per day, and an idea of the fineness of the work done may be formed from the fact that the powder has to pass through an 80 mesh bolt and blowers for separating the mica, leaving only a phenomenal quantity of that worthless and troublesome ingredient. The company have made arrangements by which the ground article can be delivered at cities along the south shore of Lake Erie, where all they can manufacture has been contracted for at a rate of freight of \$1.40 per ton.

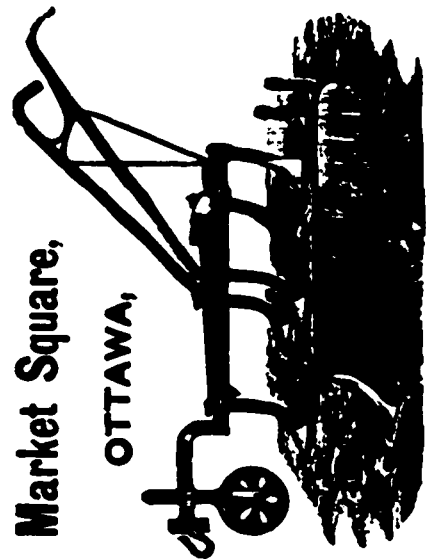
In conclusion, Canadians are an agricultural class of people. The essentials for starting Canada's growth are force and material. The climate affords the forces, light, warmth and water; the material, lime, potash, ammonia and phosphate are at its very doors; and with these there is no reason why it should not be one of the most productive countries of the world, if it only uses in a rational manner the means which nature has provided for it.

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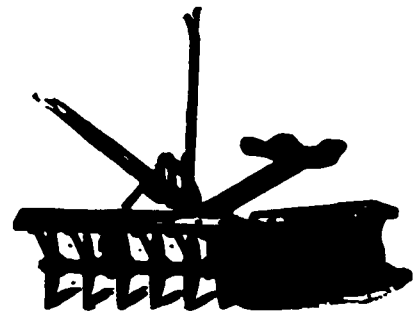
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A steaming hot cup of Johnston's Fluid Beef is the greatest heat generator, that will supply lasting warmth and vigor.

### Crude versus Acid Phosphate.

The use of mineral phosphate as manure began in consequence of the discovery by Liebig, in the year 1840, that sulphuric acid made it soluble. It is supposed that the effect of the acid upon the mineral is the same as extreme pulverization, and that in this minute form the particles become available for plant food. When the pulverized phosphate is mixed with about an equal weight of sulphuric acid it becomes soluble in water; but it is stated that all agricultural chemists now concede the fact that when soluble phosphoric acid comes into contact with the soil it immediately, or speedily, becomes insoluble. The authority of the eminent chemists Stillwell and Gladding, Thenard and Delaine, is given to support this point. If this is the case it would seem that the only reason for using the acid is that it may produce a finer sub-division of the particles than can be obtained by machinery, and when mills are secured that will effect extreme pulverization the use of the acid may be proved to be unnecessary. In the United States about \$5,000,000 worth of sulphuric acid is used every year in the manufacture of fertilizers. It is generally admitted that the acid of itself possesses no productive power, while many assert that it is positively injurious; but it is its indirect action in preparing the plant for assimilation that is supposed to warrant its use. It gives such an offensive odor that fertilizers compounded with it cannot be kept in general stores, and thus the distribution of fertilizers is hindered. If it is shown that the crude phosphate alone, or combined with other effective plant foods, is serviceable as a fertilizer, this expense and many difficulties will be overcome. The cost of mineral manures will be reduced one half, and an immense impetus will be given to the mining of phosphate and its extensive use by the farmers upon the worn-out fields that are everywhere craving its renewing and stimulating effects. For several years past Mr. Andrew H. Ward, of Boston, has ardently and persistently advocated the use of crude phosphate without acid treatment, and he possesses a mass of testimony in support of his theories that appears to thoroughly confirm them. From this formulae the Economic Fertilizer Co., of which Messrs. Butler, Breed & Co., of Boston, are agents, prepare fertilizers without sulphuric acid, and are *slowly* but *surely* bringing them into use. Mr. Ward frequently addresses the farmers upon this theme and also writes extensively for the newspapers. From recent articles contributed by him to the *Boston Globe*, we quote some testimony from the highest authorities as to the value of crude phosphates as a manure. Professor Storer, of the Agricultural Department of Harvard College, in his recent valuable work entitled "Agriculture," says, "It has repeatedly been proved by experiment that plant roots, that are abundantly supplied with nitrogenous and potassic food, can readily obtain phosphoric acid from powdered phosphatic guano, and even from powdered rock phosphate, and several observers have noticed that many of the natural phosphates are attached to an appreciable extent in the compost heap. One great trouble in regard to superphosphates is that most of them cannot be kept for any great length of time without suffering deterioration. The soluble phosphoric acid contained in them is liable to go 'back,' as the term is, or to 'revert,' as is sometimes said, to an insoluble state. English chemists think so little of reverted phosphoric acid that they put no value upon it. The pound

of useful phosphoric acid can generally be bought for the least money in the form of finely powdered phosphate rock, such as is sold under the name of 'floats.' In many situations farmers would probably find an advantage in using this material, either directly upon soils surcharged with humus, or perhaps in composts, as well as by treating it with sulphuric acid. With regard to the manner in which the phosphoric acid which has become fixed in the earth is made soluble again for the use of plants, it is sufficient to say that among the various means by which this result may be accomplished the action of carbonic acid water, and of the acid juices exuded by plant roots are conspicuous." There are, withal, special situations, soils and crops where an instructed farmer might find it profitable to use a cheap insoluble phosphate rather than the costly soluble product prepared from it.

Sir J. B. Lawes, the highest agricultural authority in Great Britain, says, "Although phosphates under every possible form have been under experiment here for forty years, I have nothing conclusive to bring forward in regard to the great superiority of soluble over insoluble phosphates."

Director George H. Cook, in the sixth annual report of the New Jersey Experimental Station, for 1885, says: "The more difficult the solubility of these phosphates the less their price; while on the other hand it is claimed that under certain, and not unusual conditions, the lower priced ones will give the largest returns in increased crops. A more useful work could hardly be undertaken by the Experiment Station than a series of field experiments for the purpose of testing these claims."

"In the trials begun in 1885 at this station, in the case of five experiments out of the eight on different forms, the phosphate being used with potash and nitrogen compounds, the increase of crop was greater with the more insoluble phosphate than with the more expensive superphosphate, and that in three of these five cases the 'floats,' the cheapest of all, did the best work—goes a little way, at least, toward showing that the superphosphate may have had its day." Mr. W. H. Bowker, in his lecture on "Homeopathy and Agriculture," says: "There may be places where insoluble phosphates can be advantageously applied, as upon lands covered with fruit trees or devoted to grass. Perennial plants, like grasses and trees, no doubt extract phosphoric acid more readily than annual plants, owing to their numerous and well-developed roots. Winter grains, especially wheat, from the long time it occupies the ground, and its growth in the fall, may also be benefitted by an insoluble or partially insoluble phosphate." Calling attention to these statements, Mr. Ward says that in 1884 more than four-fifths of the cultivated land in New England was comprised in the hay crop, while the pasturage adds a vast acreage. If it be admitted that the crude phosphates are serviceable even to grass alone, an incalculable field is opened for their use.

There is no subject of greater importance to Canada than this one, and it is to be hoped that our Agricultural Bureau will give earnest attention to experiments that may tend to supply our farmers with a cheap and effective fertilizer, easily obtained, pleasant to handle, and inviting confidence by its simplicity. This would render more "protection" to agriculture than can be obtained from any amount of fiscal legislation, and would utilize extensively the valuable phosphate deposits which Canada has the good fortune to possess.

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LEUM, Etc., Etc.

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The Canadian Government gives Free Farms of 160 acres to every male adult of 18 years, and to every female, who is head of a family, on condition of living on it, offering independence for life to every one with very little means, but having sufficient energy to settle.

Further and full information, in pamphlets and maps, given free on application by letter, post free, addressed to *Department of Agriculture, Ottawa, Canada*, or to *High Commissioner for Canada, 9 Victoria Chambers, London, S. W., England*, and all Emigration Agents.

Ottawa, September 19th, 1888.

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### List of Choice (selected) Class 1 Farm Lands in the Birtle District, Manitoba.

SECTION.	Township.	Range.	Acres.
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" 15.....	14	23	640
" 17.....	14	23	640
" 19.....	14	23	640
" 23.....	14	23	640
W 1/2 and NE 1/4 35.....	14	23	480
N 1/2 and SE 1/4 19.....	15	23	480
N 1/2 9.....	15	23	320
S 1/2 and NE 1/4 15.....	16	23	480
E 1/2 of NW 1/4 15.....	16	23	80
S 1/2 3.....	17	23	320
S 1/2 17.....	17	23	320
SW 1/4 31.....	18	26	160
NW 1/4 19.....	16	27	160
NE 1/4 25.....	16	26	160
N 1/2 of N 1/2 23 and N 1/2 of NW 1/4 24.....	13	1	240
			6,400

The above lands are well watered, and were specially selected by an experienced Manitoban for the present owner.

The Canadian Pacific Railway runs within near distance; the Great North-West Central Railway runs directly through the centre of Township 14, Range 23, and within easy distance of the other lots, and, in addition, the Manitoba and North Western Railway runs through Township 17, Range 23, so that farmers in this vicinity have their choice of outlet.

These lands will be sold in quarter sections or *en bloc* to suit purchasers. A magnificent chance for any gentleman desiring to go into profitable farming. The surplus yield of wheat for export this year (1888) is estimated at twenty million bushels, besides a large yield of barley, oats, &c. All Government lands in this vicinity have been sold. The district in which these lands are situated is immediately in the centre of the great wheat growing belt.

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#### RECENT OPINIONS OF THE PRESS.

The following extract is from the Toronto *Empire* of recent date:

Some idea of the immensity of the harvest in Manitoba may be gathered from the large demand for men existing there at the present time. A Westbourne, Man., despatch of August 27th says: "Men are very scarce. We hear that \$2.50 a day, with board, is offered."

From Meadow Lee the report is: "Good farm-labourers seem to be very difficult to get."

Mr. Metcalf, at the Intelligence office of the Dominion Government at Winnipeg, says he could place 700 labourers during harvesting operations if he only had them. The demand is very great, good men very scarce.

The Winnipeg *Sun* of August 25th says: "A number of farmers from the surrounding country are in the city daily looking for farm hands to assist in reaping the present crop. Good, experienced hands are scarce, and consequently high wages are being paid."

A. C. Fraser, Mayor of Brandon, writes of that district: "Wheat will yield 25 to 35, oats 50 and upwards, and barley 40 to 50 bushels per acre. The present prospects for settlers in Manitoba are first-class. Our country has some drawbacks, but, as far as my experience goes, is one of the best of the American continent. There are particularly good openings in this district for cheese and butter factories."

A. G. McDougall, secretary County Dennis Agricultural Society, Virden, says: "Wheat will yield about 36 bushels, oats 45 bushels, and barley 40 bushels per acre. Settlers round here, with a crop this year like last, should be in a very prosperous condition."

Mr. Thomas Nicholl, Reeve of Oakland, Manitoba, writes of the district in which he lives: "The yield of wheat will be 25 bushels, of oats 45, and of barley 40 bushels per acre." Speaking of the present prospects for settlers in that part of the country he says: "There are some homesteads open yet, but they are inferior. There is plenty of land for sale at from \$5 to \$7 per acre, and every man who is careful succeeds at farming here. I had the experience in Ontario of going upon a new farm, and must state, for the benefit of those who have to make a new start in life, that to buy land east at a high price, or go upon timbered land to make a home, is a great mistake while prairie lands are to be had. In choosing a location in this country buy in S.E. Manitoba if you can, and there is plenty yet. Ontario people all succeed here. Very few are dissatisfied."

Mr. D. Peter's, Reeve of Douglas, Man., writes: "Wheat will yield 25 bushels, oats 50 to 70, and barley 45 bushels per acre. The present prospects for settlers are the best ever known. Everything is prospering well."

Mr. John Lowe, Deputy Minister of Agriculture, returned from a trip to Manitoba to-day. Like all recent visitors to that wonderful country, he was simply charmed by the crop prospects. Everybody, he says, has the best farm, and it is expected that there will be fully 20,000,000 bushels for export. As a sample of crop growth, he says that at the Lowe farm, near Morris, a cow broke into a field of oats, and while standing among them nothing could be seen but the tip of the animal's horns. Mr. Lowe was in Manitoba when the cold dip took place, and bears out the reports of *The Empire* correspondent that the quantity of wheat injured by the frost will be infinitesimally small.

Every Canadian farmer has heard and read much about the vast resources and capabilities of the great North-West, but a personal inspection of the country is much more valuable than second-hand information, be it ever so reliable. Before forsaking the old, but probably overcrowded, homestead in Ontario, the farmer wants to satisfy himself that a removal farther west would be a change for the better. It is for the benefit of these people principally that the Canadian Pacific Railway Company are running excursions, and the farmers have not failed to appreciate the advantages they afford. The crowd was so great last night that several additional cars had at the last moment to be hitched on so as to make provision for everyone. Major Peel, the travelling passenger agent of the C.P.R., saw the excursionists safely aboard, and then Mr. W. T. Bocknell took charge of the party. He will accompany them to their destination, which is Langenburg, on the Manitoba and North-Western, and 200 miles west of Winnipeg.

Ottawa *Free Press*, 10th August, 1888:

Mr. A. Mutchmor, of the firm of Mutchmor, Gordon & Co., has just returned from a ten weeks' sojourn in Manitoba. He reports the crops in the prairie province the best he ever saw in any country in the world. With the exception of one or two localities the frost has not injured the grain to any extent, and as harvesting commenced generally in the province on the 20th inst., the danger is now past, except to very late grain, the proportion of which is very small, as the farmers are all alive to the importance of very early sowing and planting to avoid early frosts. Farm lands are in great demand and a number of sales made, especially in Southern Manitoba on account of the rich fertile soil and proximity to the best markets. Through competition in freight rates to Duluth or Port Arthur, five cents per bushel extra at these terminal points, enhances the value of every acre of land in these localities in the same proportion, and this advantage will exist for years to come. With the exception of a few jealous and disappointed individuals interested in other railway schemes of their own, for which they have been expecting aid from the local Government, the contract now under consideration by the Legislature between the Government and the Northern Pacific Railway Company is generally regarded with favour as the best that can be made at present in the interest of the province as a whole, for the reason that it is the only channel through which competition in freight rates can be secured for the present crop. A reduction of eight cents per bushel is promised, but suppose it is only five cents per bushel upon the surplus of the present crop, it will more than pay the cost of the railways now under construction. This is the standpoint of Premier Greenway and Attorney-General Martin, and it will be found to be the popular one in the province, as it appeals directly to the pockets of the people, by insuring them a better price for their grain. Thousands of dollars will be invested in farm lands in the prairie province this fall, and no safer and better investment can be made, as a tremendous immigration is bound to take place from all parts of the world within the next year.

### Canadian Fertilizer Industry.

The only attempts so far made to utilize Canadian phosphate at home have been at the fertilizer factories in Brockville and Smith's Falls, Ontario. The factory at Smith's Falls was established originally for the manufacture of chemicals of various kinds, but a few years ago the production of fertilizers was tried as an experiment, and as a very good article was made, with no adulterations, it got a good name and the demand has been steadily increasing. Mr. R. J. Brodie, a graduate of McGill College, has charge of the works. Mr. Brodie states that he makes the sulphuric acid from pure sulphur. He gets rid of the hydrofluoric acid gas, which is produced by the action of the sulphuric acid on the apatite, by a simple arrangement of wooden chimneys, thus solving a difficulty which has embarrassed many persons in their first efforts to use Canadian phosphate. He makes a "complete fertilizer," that is, a mixture of the three principle ingredients of plant food, namely: phosphate, potash and ammonia. The demand is growing in a very encouraging manner, for when a farmer tries it once he generally comes back for more. Mr. Brodie says he could sell many thousand tons the coming year if he could make it, but the factory is small and the facilities not very great.

There is evidently a large and extending field in this direction both for profit and usefulness. The soil of the older settled Provinces of Canada has become impoverished by many years of cropping without replenishment, and districts that once yielded great stores of grain now only afford the scantiest pasturage. If one was animated only by patriotic and philanthropic zeal he could render no greater benefit to his country than to

enter on a missionary crusade to enlighten the farmers to the value of mineral manures; or if he likes to make his benevolence profitable to himself let him supply the article with which the farmer may prove the truth of his teachings. The establishment of fertilizer factories in Canada and the education of the farmer in the use of manure is a cause that invites the best attention both of the capitalist and of the Government.

### Soluble and Insoluble Phosphates.

A. H. Ward, Boston.

Another comparative experiment with phosphate made by the Pennsylvania State College Experiment Station confirms experiments made by the New Jersey Experiment Station and many others, and shows that the less soluble and cheaper forms of phosphoric acid are likely to prove equal or superior to the more costly soluble acid phosphates.

The results of these various experiments should be well known by the various experiment stations, and, if they are known, what justifies them in making so great a difference in value as 400 per cent. between soluble and insoluble phosphates? It all comes out of the farmers.

A bulletin of the Pennsylvania State College Experiment Station gives the results of experiments made with phosphates in a four-crop rotation in the years 1883-7, the first year's crop being grown without manure, to determine the relative fertility of the several plots. The plots were twelve in number, each of them one-twentieth of an acre in extent, and the soil is what is usually called limestone clay. Oats were grown in 1883, and the product showed considerable variation in the fertility of the several plots. Taking 100 as the average of all, they ranged from 91.62 to 114.52, eight being under the average and four over it. The rotation was in the order of wheat, grass, corn and oats, and the fertilizers were applied to wheat and corn only—the grass and oats getting the residual effects. Two plots were unmanured throughout the experiment, and from the results of these the values of the fertilizers were computed. The experiments were made to study the effects of different forms of phosphoric acid, and to guard against failure from a lack of any of the elements of plant food, each of the plots, except the two unmanured ones, as treated to 200 pounds of muriate of potash and 240 pounds of sulphate of ammonia per acre. They were thus supplied with nitrogen, potash, sulphuric acid and chlorine, while the limestone soil contained a vast excess of lime, magnesia and iron above what the crops could possibly use. Two of the plots received no other manuring, and the remaining eight were treated in pairs as follows:

1. 200 pounds dissolved boneblack, the phosphoric acid largely soluble.
2. 200 pounds dissolved blackbone, previously treated with lime; phosphoric acid largely reverted.
3. 150 pounds fine ground bone.
4. 150 pounds ground South Carolina phosphate; phosphoric acid largely insoluble.

These fertilizers were all standard articles of trade. Now for the results. Of the 56 single cases recorded, 36 show unmistakable gain resulting from the use of phosphoric acid, six show a probable gain, eight a doubtful gain, and the remaining six an apparent loss. But the results give no satisfactory proof that one form of phosphoric acid is superior to another. It would appear, however, that a limestone soil is not the

most suitable for a phosphate fertilizer, owing to the circumstance that it precipitates the superphosphate so quickly as to prevent due distribution to the roots of plants. A comparison of the results obtained in the experiment with the results of other experiments appears to justify the conclusion that "upon lime soils, upon very light sandy soils, and upon pure peat soils, the less soluble and cheaper forms of phosphoric acid are likely to prove equal or superior to the more costly soluble acid of the superphosphates. But the director of the Pennsylvania station wisely enjoins caution in departure from established practices. A few simple and inexpensive trials of reverted or insoluble phosphates on a small scale would readily show one contemplating their use whether they were likely to prove profitable under these circumstances or not. No general rule can apply to every soil.

**Directions for Composting Muck or Peat.**—Take  $1\frac{1}{2}$  cords peat, which, as dug out, will weigh about 11,225 pounds, and, well dried, will lose three-quarters in bulk, and weigh about 2,500 pounds. Add to this quantity 100 pounds of soda ash and 1,200 pounds of fine ground raw phosphate. After all these ingredients are mixed together, it is left in a heap to heat and ferment, which generates carbonic acid and ammonia, both of which act on the raw phosphate, rendering it soluble. The compost, after lying about six weeks, will have fermented, and should be shovelled over, when it is fit for use, and by exposure and evaporation the weight will be reduced to about 4,000 pounds, or two tons. The following shows cost and constituents of two tons peat compost: Peat,  $1\frac{1}{2}$  cords, as dug out, \$2.00; raw phosphate, fine ground, 1,000 lbs., \$4.00; soda ash, 80 per cent., 100 lbs., \$3.00; labour, \$2.00; total cost for two tons, \$11.00

**Ground Phosphate.**—A conviction of the utility of the application of crude phosphate to the soil is steadily gaining way. Experiments with Canadian phosphate at Newport during the past season have shown a marked effect upon grape vines in hot-houses, and its effect upon garden plants has been established beyond dispute. Many small manufacturers are glad to get the ore in the pulverized state for treatment with acid, and there seems to be much encouragement for the erection of grinding mills. In the future it is probable that the high grade ore will be selected for shipment abroad in the crude state, and all the low grade ore will be ground and raised in quality by freeing it from mica and other impurities. The market for this will be found in the United States and Canada. More active exertions ought to be made by the Department of Agriculture to impress upon farmers the desirability of using phosphoric manures. It is thought that Kingston affords a favourable site for the erection of phosphate grinding mills. Coal can be had cheaply there, and the phosphate can be brought to it at low rates by the Rideau Canal, and exported as ballast in the lake schooners. It is likely that this enterprise will be undertaken before long, and will have a marked effect in stimulating the phosphate industry.

**The Fertilizer Trade in South Carolina.**—The activity of the fertilizing industry has not been confined to Charleston, nor to the State, for there are many manufactories in

other Southern States that use the South Carolina phosphates for the manufacture of fertilizers. The business of these concerns is prosperous. This business is a boon to railroads and steamship lines. The shipments for the past three months, from Charleston alone, required over 1,500,000 sacks to hold the material. Over 2,062,500 pounds of burlaps were used in making the sacks, and over 11,250 cars were required to transport them, filled with fertilizers, over the railroads. The Charleston companies will consume, in making the year's supply of fertilizers, over 70,000 tons of phosphate rock, and nearly half as much sulphur, besides kaimit, marl, potash, blood, fishscrap, bone black, azotin, nitrogen, tankage, cotton seed meal, and other materials.

In those parts of Europe where the sugar beet is largely grown—Belgium and Denmark, for instance—no fertilizer has been found equal to phosphate, and the same remark might well be applied to the grain producing farms of our older provinces. The rigid inspection to which the crude materials is subject in England tends greatly to keep up the standard of our shipments, and the high percentage of Canadian phosphate will always secure for it a foremost place and an eager demand. Prof. Dawkins, comparing the phosphate obtained from various countries, states the percentage that Canada yields, out of a mean of analysis, is 57.52 of tribasic phosphate of lime.

Phosphate of lime (apatite) was first discovered in Burgess, Ontario, in 1847. In 1860 the first shipment of the mineral was made, amounting to about 100 tons.

The earliest discovery of apatite in the County of Ottawa was made in 1829 by Lieut. Ingall, of the 15th Regiment, while engaged in certain geological explorations. Mining operations were not engaged in until 1873.

The entire phosphate beds of South Carolina, so far as discovered and defined, have been estimated to cover an area of 240,000 acres. It was not known that the rock possessed any commercial value until the year 1865.



Department of Inland Revenue.

### An Act Respecting Agricultural Fertilizers.

The public is hereby notified that the provisions of the Act respecting Agricultural Fertilizers came into force on the 1st of January, 1886 and that all Fertilizers sold thereafter require to be sold subject to the conditions and restrictions therein contained—the main features of which are as follows:

The expression "fertilizer" means and includes all fertilizers which are sold at more than TEN DOLLARS per ton, and which contains ammonia, or its equivalent of nitrogen, or phosphoric acid.

Every manufacturer or importer of fertilizers for sale, shall, in the course of the month of January in each year, and before offering the same fertilizer for sale, transmit to the Minister of Inland Revenue, carriage paid, a sealed glass jar, containing at least two pounds of the fertilizer manufactured or imported by him, with the certificate of analysis of the same, together with an affidavit setting forth that each jar contains a fair average sample of the fertilizer manufactured or imported by him; and such sample shall be preserved by the Minister of Inland Revenue for the purpose of comparison with any sample of fertilizer which is obtained in the course of the twelve months then next ensuing from such manufacturer or importer, or collected under the provisions of the Adulteration Act, or is transmitted to the chief analyst for analysis.

If the fertilizer is put up in packages, every such package intended for sale or distribution within Canada shall have the manufacturer's certificate of analysis placed upon or securely attached to each package by the manufacturer; if the fertilizer is in bags it shall be distinctly stamped or printed upon each bag; if it is in barrels, it shall be either branded, stamped or printed upon the head of each barrel or distinctly printed upon good paper and securely pasted upon the head of each barrel, or upon a tag securely attached to the head of each barrel; if it is in bulk, the manufacturer's certificate shall be produced and a copy given to each purchaser.

No fertilizer shall be sold or offered or exposed for sale unless a certificate of analysis and sample of the same shall have been transmitted to the Minister of Inland Revenue and the provisions of the foregoing sub-section have been complied with.

Every person who sells or offers or exposes for sale any fertilizer, in respect of which the provisions of this Act have not been complied with—or who permits a certificate of analysis to be attached to any package, bag or barrel of such fertilizer, or to be produced to the inspectors to accompany the bill of inspection of such inspector, stating that the fertilizer contains a larger percentage of the constituents mentioned in sub-section No. 11 of the Act than is contained therein—or who sells, offers or exposes for sale any fertilizer purporting to have been inspected, and which does not contain the percentage of constituents mentioned in the next preceding section—or who sells or offers or exposes for sale any fertilizer which does not contain the percentage of constituents mentioned in the manufacturer's certificate accompanying the same, shall be liable in each case to a penalty not exceeding fifty dollars for the first offence, and for each subsequent offence to a penalty not exceeding one hundred dollars. Provided always that deficiency of one per centum of the ammonia, or its equivalent of nitrogen, or of the phosphoric acid, claimed to be contained, shall not be considered as evidence of fraudulent intent.

The Act passed in the forty-seventh year of Her Majesty's reign, chaptered thirty-seven and entitled, "An Act to prevent fraud in the manufacture and sale of agricultural fertilizers," is by this Act repealed, except in regard to any offence committed against it or any prosecution or other act commenced and not concluded or completed, and any payment of money due in respect of any provision thereof.

A copy of the Act may be obtained upon application to the Department of Inland Revenue, as well as a copy of a Bulletin which it is proposed to issue in April, 1888, concerning the fertilizers

E. MIALL,

15th Dec., 1887.

Commissioner.

# L. T. ROCHON

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### MONEY ORDERS.

MONEY ORDERS may be obtained at any Money Order Office in Canada, payable in the Dominion; also in the United States, the United Kingdom, France, Germany, Italy, Belgium, Switzerland, Sweden, Norway, Denmark, the Netherlands, India, the Australian Colonies, and other countries and British Colonies generally.

On Money Orders payable within Canada the commission is as follows:

If not exceeding \$4.....	2c.
Over \$4, not exceeding \$10.....	5c.
" 10, " " 20.....	10c.
" 20, " " 40.....	20c.
" 40, " " 60.....	30c.
" 60, " " 80.....	40c.
" 80, " " 100.....	50c.

On Money Orders payable abroad the commission is:

If not exceeding \$10.....	10c.
Over \$10, not exceeding \$20.....	20c.
" 20, " " 30.....	30c.
" 30, " " 40.....	40c.
" 40, " " 50.....	50c.

For further information see OFFICIAL POSTAL GUIDE.

Post Office Department, Ottawa.  
15th Sept., 1888.



SEALED TENDERS addressed to the undersigned, and endorsed "Tender for Post Office, Goderich, Ont.," will be received at this office until Monday, 15th October, 1888, for the several works required in the erection of Post Office, &c., at Goderich, Ont.

Specifications and drawings can be seen at the Department of Public Works, Ottawa, and at the office of the Town Clerk at Goderich, Ont., on and after Wednesday, 5th Sept., and tenders will not be considered unless made on the form supplied and signed with actual signatures of tenderers.

An accepted bank cheque, payable to the order of the Minister of Public Works, equal to five per cent. of amount of tender, must accompany each tender. This cheque will be forfeited if the party decline the contract, or fail to complete the work contracted for, and will be returned in case of non-acceptance of tender.

The Department does not bind itself to accept the lowest or any tender.

By order,  
A. GOBEIL,  
Secretary.

Department of Public Works,  
Ottawa, 31st August, 1888.

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June 12th, 1888.



# Mining Regulations

TO GOVERN THE DISPOSAL OF

## Mineral Lands other than Coal Lands, 1886.

THESE REGULATIONS shall be applicable to all Dominion Lands containing gold, silver, cinnabar, lead, tin, copper, petroleum, iron or other mineral deposits of economic value, with the exception of coal.

Any person may explore vacant Dominion Lands not appropriated or reserved by Government for other purposes, and may search therein, either by surface or subterranean prospecting for mineral deposits, with a view to obtaining under the Regulations a mining location for the same, but no mining location or mining claim shall be granted until the discovery of the vein, lode or deposit of mineral or metal within the limits of the location or claim.

### QUARTZ MINING.

A location for mining, except for iron veins, lodes or ledges of quartz or other rock in place, shall not exceed forty acres in area. Its length shall not be more than three times its breadth, and its surface boundary shall be four straight lines, the opposite sides of which shall be parallel, except where prior locations would prevent, in which case it may be of such a shape as may be approved of by the Superintendent of Mining.

Any person having discovered a mineral deposit may obtain a mining location therefor, in the manner set forth in the Regulations which provides for the character of the survey and the marks necessary to designate the location on the ground.

When the location has been marked conformably to the requirements of the Regulations, the claimant shall within sixty days thereafter, file with the local agent in the Dominion Land Office for the district in which the location is situated, a declaration or oath setting forth the circumstances of his discovery, and describing, as nearly as may be, the locality and dimensions of the claim marked out by him as aforesaid; and shall, along with such declaration, pay to the said agent an entry fee of FIVE DOLLARS. The agent's receipt for such fee will be the claimant's authority to enter into possession of the location applied for.

At any time before the expiration of FIVE years from the date of his obtaining the agent's receipt it shall be open to the claimant to purchase the location on filing with the local agent proof that he has expended not less than FIVE HUNDRED DOLLARS in actual mining operations on the same; but the claimant is required, before the expiration of each of the five years, to prove that he has performed not less than ONE HUNDRED DOLLARS' worth of labor during the year in the actual development of his claim, and at the same time obtain a renewal of his location receipt, for which he is required to pay a fee of FIVE DOLLARS.

The price to be paid for a mining location shall be at the rate of FIVE DOLLARS PER ACRE, cash, and the sum of FIFTY DOLLARS extra for the survey of the same.

No more than one mining location shall be granted to any individual claimant upon the same lode or vein.

### IRON.

The Minister of the Interior may grant a location for the mining of iron, not exceeding 160 acres in area which shall be bounded by north and south and east and west lines astronomically, and its breadth shall equal its length. Provided that should any person making an application purporting to be for the purpose of

mining iron thus obtain, whether in good faith or fraudulently, possession of a valuable mineral deposit other than iron, his right in such deposit shall be restricted to the area prescribed by the Regulations for other minerals, and the rest of the location shall revert to the Crown for such disposition as the Minister may direct.

The regulations also provide for the manner in which land may be acquired for milling purposes, reduction works or other works incidental to mining operations.

Locations taken up prior to this date may, until the 1st of August, 1886, be re-marked and re-entered in conformity with the Regulations without payment of new fees, in cases where no existing interests would thereby be prejudicially affected.

### PLACER MINING.

The Regulations laid down in respect to quartz mining shall be applicable to placer mining as far as they relate to entries, entry fees, assignments, marking of localities, agents' receipts, and generally where they can be applied.

The nature and size of placer mining claims are provided for in the Regulations, including bar, dry, bench, creek or hill diggings, and the RIGHTS AND DUTIES OF MINERS are fully set forth.

The Regulations apply also to

### BED-ROCK FLUMES, DRAINAGE OF MINES AND DITCHES.

The GENERAL PROVISIONS of the Regulations include the interpretation of expressions used therein; how disputes shall be heard and adjudicated upon; under what circumstances miners shall be entitled to absent themselves from their locations or diggings, etc., etc.

### THE SCHEDULE OF MINING REGULATIONS

Contains the forms to be observed in the drawing up of all documents such as:— "Application and affidavit of discoverer of quartz mine." "Receipt for fee paid by applicant for mining location." "Receipt for fee on extension of time for purchase of a mining location." "Patent of a mining location." "Certificate of the assignment of a mining location." "Application for grant for placer mining and affidavit of applicant." "Grant for placer mining." "Certificate of the assignment of a placer mining claim." "Grant to a bed rock flume company." "Grant for drainage." "Grant of right to divert water and construct ditches."

Since the publication, in 1884, of the Mining Regulations to govern the disposal of Dominion Mineral Lands the same have been carefully and thoroughly revised with a view to ensure ample protection to the public interests, and at the same time to encourage the prospector and miner in order that the mineral resources may be made valuable by development.

COPIES OF THE REGULATIONS MAY BE OBTAINED UPON APPLICATION TO THE DEPARTMENT OF THE INTERIOR.

**A. M. BURGESS,**

*Deputy Minister of the Interior.*

# THE CANADIAN MINING REVIEW

(ESTABLISHED 1882.)

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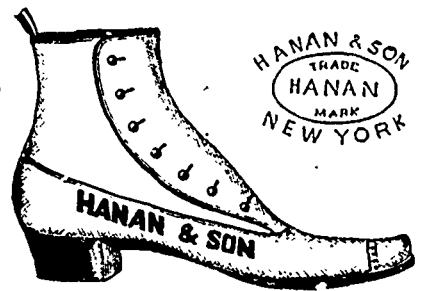




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Ontario Mining Regulations.

The following summary of the principal provisions of the General Mining Act of the Province of Ontario is published for the information of those interested in mining matters in the Algoma District, and that part of the Nipissing District north of the Mattawan River, Lake Nipissing and French River.

Any person or persons may explore for mines or minerals on any Crown Lands surveyed or unsurveyed, not marked or staked out or occupied.

The price of all lands sold as mining locations or as lots in surveyed townships is two dollars per acre cash, the pine timber being reserved to the Crown. Patentees or those claiming under them may cut and use such trees as may be necessary for building, fencing or fuel, or for any other purpose essential to the working of mines.

Mining locations in unsurveyed territory shall be rectangular in shape, and the bearings of the outlines thereof shall be due north and south, and due east and west astronomically, and such locations shall be one of the following dimensions, viz: eighty chains in length by forty chains in width, containing 320 acres, or forty chains square, containing 160 acres, or forty chains in length by twenty chains in width, containing 80 acres.

All such locations must be surveyed by a Provincial Land Surveyor, and be connected with some known point or boundary at the cost of the applicant, who must file with application surveyor's plan, field notes and description of location applied for.

In all patents for mining locations a reservation of five per cent. of the acreage is made for roads.

Lands patented under the Mining Act are free from all royalties or duties in respect to any ores or minerals thereon, and no reservation or exception of any mineral is made in the patents.

Lands situated south of the Mattawan River, Lake Nipissing and French River are sold under the Mining Act at one dollar per acre cash.

Affidavits showing no adverse occupation, improvement or claim should accompany applications to purchase.

T. B. PARDEE,  
Commissioner.

Department of Crown Lands, Toronto.

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