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THE

Canadian

Mining



REVIEW

Vol. V.—No. 6.

1887.—OTTAWA, AUGUST—1887.

Vol. V.—No. 6.

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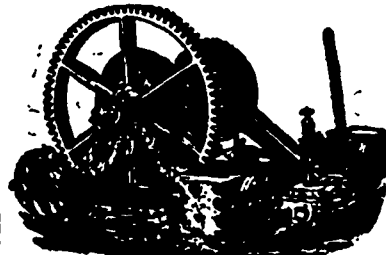


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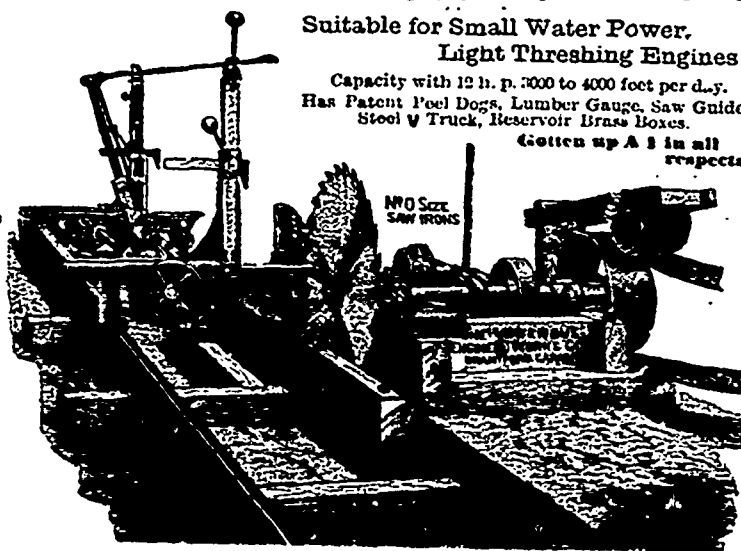
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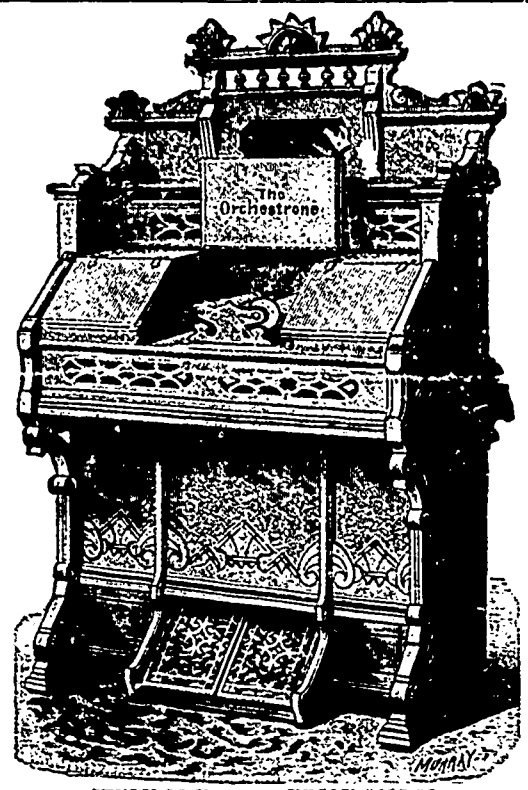
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Notice to Contractors.

SEALED TENDERS addressed to the undersigned and endorsed "Tender for Four Detached Residences at Experimental Farm, near Ottawa," will be received at this office until MONDAY, 29th August, for the several works required in the erection and completion of the

Four Detached Residences at Experimental Farm, near Ottawa.

Plans and specifications can be seen at the Department of Public Works, Ottawa, on and after Monday, 15th August. Intending contractors should personally visit the site and make themselves fully cognizant of the work to be done, according to the said plans and specifications, before putting in their tenders. Persons tendering are further notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures.

Each tender must be accompanied by an accepted bank cheque made payable to the order of the Honorable the Minister of Public Works, equal to five per cent. of the amount of the tender, which will be forfeited if the party decline to enter into a contract when called upon to do so, or if he fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department will not be bound to accept the lowest or any tender.
 By order,
 A. GOBEIL,
 Secretary.
 Department of Public Works,
 Ottawa, August 10th, 1887. 6-1



Notice to Contractors.

SEALED TENDERS addressed to the undersigned and endorsed "Tender for Barn and Stabling at Experimental Farm, near Ottawa," will be received at this office until THURSDAY, 4th August, for the several works required in the erection and completion of the

Barn and Stabling at Experimental Farm, near Ottawa.

Plans and specifications can be seen at the Department of Public Works, Ottawa, on and after Saturday, the 23rd July. Intending contractors should personally visit the site and make themselves fully cognizant of the work to be done, according to the said plans and specifications, before putting in their tenders.

Persons tendering are further notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures. Each tender must be accompanied by an accepted bank cheque made payable to the order of the Honorable the Minister of Public Works, equal to five per cent. of the amount of the tender, which will be forfeited if the party decline to enter into a contract when called upon to do so, or if he fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department will not be bound to accept the lowest or any tender.
 By order,
 A. GOBEIL,
 Secretary.
 Department of Public Works,
 Ottawa, 15th July, 1887. 6-2



NOTICE RESPECTING PASSPORTS.

PERSONS requiring passports from the Canadian Government should make application to this Department for the same, such application to be accompanied by the sum of four dollars, in payment of the official fee upon passports as fixed by the Governor-in-Council.

G. POWELL,
 Under Secretary of State.
 OTTAWA, 19th Feb., 1886.



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, and which 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 inspector, 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.

E. MIALL,
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The Phosphate Trade of Canada.

By H. B. Small, Ottawa.

There are probably very few persons beyond those interested in the trade who know what Apatite is, or to what uses it is applied, and when they are told that the shipments of crude rock in 1886 reached the large amount of 24,876 tons, 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 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 belong 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 phosphate 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 disturbance 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 principle sources of supply may be stated as follows:—the West Indies and other islands of the Caribean 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. Vennor, 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 Longboro 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 course 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 direction 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.

(To be continued.)

Use of the Magnetic Needle in Exploring for Iron Ore.

By Mr. B. H. Brough, Assoc. R.S.M., G.G.S., F.L.C.

(Continued from July number.)

WREDE'S METHOD.

The method proposed by the Baron F. Wrede, in 1874, consists in exploring for two points, one east and the other west of the ore mass, at which the deflections of the needle from the magnetic meridian are equal, but to the west on one side and to the east on the other. The observations are made in the ore field in the direction of the magnetic east and west line, the approximate position of which is assumed to be known. Midway between the two points there must be a third, where there is no declination. The position of the meridian passing over the ore body is thus determined. It is then necessary to determine the magnetic intensity and inclination, in order to calculate where the ore pole is situated. For this purpose it is necessary to find out the position of that point for which the horizontal component of the earth's magnetism is zero, and where the angle of inclination due to the magnetism of the ore bed alone is 90°.

THALÉN'S METHOD.

Professor R. Thalén, of the University of Upsala, employs a modification of Weber's portable magnetometer, or of Lamont's theodolite. He cannot be said to have invented the instrument, since its principle has been known since Gauss' time (1830). Weber's magnetometer dates from 1836, and Lamont's theodolite from 1840. In its simplest form, the instrument consists of a compass box $3\frac{1}{2}$ inches in diameter, divided into degrees or half degrees. At right angles to the diameter, passing through the zero point of the graduation, an arm extends horizontally. This serves as a sight in setting out lines in the field, and receives the bar magnet for the deviation measurements. A deflection of the needle is caused by means of this magnet, the longitudinal direction of which is parallel to the arm, and the distance of which from the needle always remains unaltered. On the other side of the compass box there is a socket, into which a rod of soft iron can be placed perpendicularly for inclination measurements. This iron rod, like the magnet, affects a deflection of the needle. The instrument rotates about a vertical axis, and is provided with a spirit-level and levelling screws. In order to simplify the apparatus still further, the compass box may be fastened to a rectangular board, the edges of which can be used as sights; whilst the board

itself receives the bar magnet, which is fixed by screws or springs into the position that is determined once for all. As support for the instrument, an ordinary surveyor's plane-table may be employed.

The observations with the magnetometer consist for the most part of deviation measurements, for which two different methods may be employed. In one method the instrument is placed so that the needle is directed to the zero point, the bar magnet having been removed from its place. Directly the magnet is replaced the needle will deviate from its original position, the angle of deviation being read from the graduated circle. In the second method the instrument is turned, while the magnet is in its place, until the needle points to zero. The bar magnet is then removed, and, when the needle has come to rest, the angle is read. In this method, under similar conditions, the angle obtained will be greater than in the former method. Of the two methods, the latter, or *sine method*, is the more delicate; but it requires more time than the former, as the instrument has to be re-adjusted at every observation with the magnet and iron rod. This method has the disadvantage of not being applicable in the extreme north of the ore-field, where the magnetism of the ore-bed is powerful. In the former, or *tangent method*, the instrument remains unmoved during both measurements. The disadvantage, however, is that the so-called constants of the instrument vary with the angle of deviation. This does not matter if the results are to be arrived at geometrically, since it is then merely necessary to join the points where the same angle is obtained, quite regardless of the magnitude of the angle and of its corresponding constant. If the position of the ore is to be determined by calculation, the *sine method* must be employed.

Where no ore is present, the needle is acted upon by two forces, one of which is due to the fixed magnet, and the other to the horizontal component of the earth's magnetism. These two forces acting simultaneously, the needle takes up a position in the direction of their resultant. Then if α is the angle of deviation, and H the component of the earth's magnetism, the following formulæ are obtained:

$$\begin{aligned} \text{for the tangent method: } & H \tan. \alpha = K_1, \\ \text{for the sine method: } & H \sin. \alpha = K_2, \end{aligned}$$

in which K_1 and K_2 are constants, so long as the size and position of the magnet remain unaltered. If these constants are known, the actual value of H may be found from the magnitude of the observed angle by either of the methods. If the constants are unknown, only the relative value of H may be found. When observations are made near an iron ore field, in both formulæ H must be replaced by R , the resultant of the horizontal component of the earth's magnetism and the magnetism of the deposit. The formulæ then become:

$$R \tan. \alpha = K_1, \text{ and } R \sin. \alpha = K_2.$$

When the deviations are caused by the soft iron rod instead of by the magnet, somewhat similar formulæ are obtained; but the magnetism of the iron rod being due to induction, its intensity is proportional to the variations of the vertical components of the earth's magnetism. It follows that the constant K of each formulæ in this case must be replaced by a magnitude that varies with the magnetism of the rod. Observations with the iron rod indicate the inclination of the earth's magnetism; whilst observations with the bar magnet serve for determining the horizontal components of the same terrestrial force. Consequently, by combining the two methods, it is possible to find out the vertical components of the magnetic force.

In order to survey an ore field, it must first be divided into squares with sides 100, 50, or 25 feet in length. Then at every angle of these squares, the deviation must be observed with the magnet and iron rod. Similar observations must be made on ground free from iron, and so far distant from the ore field that the influence of the ore is not felt. It is also advisable to determine the magnetic declination for each point of observation. This may be done by directing the sights along one of the lines that has been set out, and reading the bearing, after the fixed magnet and iron rod have been removed. Observations must also be made along the magnetic meridian north of the supposed ore pole to determine where the north-seeking end of the free needle changes its direction from north to south, or whether it invariably points towards the north.

When these determinations of declination, horizontal intensity, and inclination have been carefully made, and the angles obtained noted on paper divided into squares, lines are drawn for each of the three series of observations, exhibiting equal declination (isogonic lines), equal intensity (isodynamic lines), and equal inclination (isoclinic lines). This is done in each case by joining the points for which equal angles were obtained. The curvature of the lines is drawn as naturally as possible, care being taken to avoid sharp bends. The curves of inclination and intensity thus constructed are closed, and have an approximately circular or elliptical shape, provided that a single isolated ore mass is being dealt with. They are grouped around two points. The one at the north is where the greatest angle of deviation was found, whilst that at the south is where the smallest angle was obtained. Between these two groups of curves is an open curved line representing the neutral angle. In this neutral line the intensity is the same as if no ore was present. The straight line joining the points where the greatest and smallest angles were obtained passes over the centre of the ore mass, and indicates the direction of the magnetic meridian of the ore field. Directly beneath a point in this line, in a vertical ore bed, the greatest mass of ore occurs. The rule that most generally holds good in searching for iron ore is, that the ore mass is to be found immediately beneath the point where the magnetic meridian cuts the neutral line.

The isogonic lines consist of concentric ovals placed, as a rule, symmetrically on both sides of the meridian. From the shape and position of these curves useful indications may be obtained regarding the position of the ore pole, and the shape of the deposit.

TIBERG'S METHOD.

The instruments employed by E. Tiberg consist of a new magnetic instrument for determining the inclination, a plain-table, and a sighting instrument. The inclination instrument consists of a round box $3\frac{1}{2}$ inches in diameter and half an inch deep, fixed in two square brass frames with $3\frac{1}{2}$ inch sides. At its circumference it has a graduated ring, and in the middle a magnetic needle 2.36 inches in length. Its axis is at right angles to the plane of the box, and rests upon two agate supports. The needle can thus move freely when the instrument is placed horizontally or vertically. The instrument differs from other instruments for determining inclination in that the centre of gravity of the magnetic needle is a little below its horizontal axis when the instrument is in a vertical position. The needle is compensated for the vertical force of the earth's magnetism by a piece of wax fastened to its south-seeking end. The instrument is provided with a

spirit-level for horizontal adjustment, and with a ring, by means of which it can be suspended vertically. The sighting instrument is a brass plate about a foot in length, provided at one end with four square flanges to receive the inclination instrument for horizontal measurements. At right angles to this square, there is a groove in the plate with a sliding receptacle for the bar magnet required for horizontal measurements. Four folding sights are attached to the plate in such a way that their lines of sight form a right angle. The instrument, consequently, can be used as a cross-head. Two special sights are added for levelling operations, and the instrument is provided with a circular spirit-level. The plane table employed is of the usual form.

The observations for vertical measurements are made at the surface with the plane-table or by hand. The inclination instrument is fastened to the plane-table, levelled, and turned until the needle points to 90°. The instrument is then raised with the ring at the top, and placed at right angles to the magnetic meridian, and the angle indicated by the needle observed. The same operation has to be done by hand if the plane-table is not available. When the ore appears to be deep, or when the horizontal intensity is powerful, recourse must be had to the plane-table.

The formula for calculating the vertical intensity G is—

$$G = K \tan. v,$$

in which v is the angle given by the needle—that is, its deviation from the horizontal—and K a constant varying in different instruments from 0.75 to 1.4 of the earth's horizontal magnetic force. Lines of equal vertical intensity may thus be constructed. In magnetic plans it is usual to employ a blue colour for positive intensity, and a red colour for negative intensity. The accuracy attainable with this method is from 0.2 to 0.1 per cent. of the earth's magnetic force in central Sweden. With the plane table 150 to 300 observations may be made per day, and 150 to 500 by hand. For each ore field surveyed the needle must be compensated afresh, and a preliminary magnetic survey made. The field is then divided into squares, with sides 40 feet in length. The base line is as near as possible in the middle of the field, and parallel to the direction of the strike of the deposit. In making the survey observations are made every 10 feet, and in some cases every 5 feet, in the immediate vicinity of the ore, and every 20 to 40 feet or more when further distant from the ore. The general rule is to make as many observations as may be required to indicate what the appearances of the curves will be. Heights are estimated by the eye, or by a preliminary levelling with the sighting instrument, and the more important topographical details are noted.

The maximum of intensity is generally presented by the point where the ore is nearest to the surface. It may also be situated between two adjacent deposits—in which case the intensity decreases, at first slowly, or not at all, and then comparatively rapidly. The distance to the centre of a vertical ore-bed may be taken as at least 0.7 of half the breadth of the north-polar attraction. This rule is, however, not very trustworthy. The vertical distance of the plane of observation from the upper ore pole is equal to the horizontal distance of the point where the needle deviated most from the horizontal from that where $\frac{1}{2}$ of the greatest intensity was found. It is also equal to $1\frac{1}{2}$ of the distance of the point where the needle dipped most from that where half the maximum was found. The latter rule is the best.

Sometimes these calculations enable an opinion to be formed of the relative values of two similar ore beds. For two deposits of a similar character, situated at least 30 feet beneath the surface, it may be assumed that the deposit, for which the product of the greatest intensity and the polar distance is the greater, contains the larger quantity of ore for the same length of deposit. If the polar surfaces of the two beds are limited this product must be replaced by the square of the polar distance.

A good idea of a deposit may be formed from the appearance of the curves of intensity. Regular, long extended, elliptical curves, enclosing a long but narrow district of greatest intensity, always indicate a regular lenticular mass. More circular curves may indicate a segregation of ore if the intensity decreases regularly. Irregular curves indicate more or less irregular deposits.

In exploring for courses of ore in the mine, a base line is marked out in the level, and observations made every 10 feet at least. At each station, three observations have to be made:—
1. To determine the direction of the total horizontal intensity by means of the sighting instrument, the deviation of the magnetic needle from the base line being observed.
2. To determine the magnitude of its force by means of the bar magnet.
3. To determine the vertical intensity by means of the inclination instrument. Vertical measurements must also be made at the top and floor of the level, and for this purpose the instrument may be held in the hand. On neutral ground at the surface, the horizontal force of the earth's magnetism and the direction of the earth's magnetic meridian must be determined. The results of all the observations are represented on paper, along the base line, as arrows showing the horizontal forces of the magnetism of the ore at the points of observation. If all or part of the arrows are directed towards the same point, there the ore may be assumed to be. The ore would be at the level at which the observations were made, if the vertical intensity is negative. When the arrows approach in front or behind, the plane of observation is above or below the magnetic centre of the ore. When the vertical intensity is positive, the ore may be above or below the plane of observation, always assuming that a more or less vertical ore mass is being dealt with.

CONCLUSION.

From the sketch of the new methods given above, it will be seen how admirably the principles of terrestrial magnetism have been applied in Sweden for the exploration of iron ores. The results are not only of scientific interest, but also of great practical importance. To illustrate this, it may be mentioned that by applying his method, Tiberg has discovered very important deposits of ore at the mines of Langban and Sikberg. Some interesting results, too, have been obtained by Professor Thalén, who has been able, with the magnetometer, to determine the various percentages of powdered iron ore and microscopic fragments of magnetic minerals occurring in the various beds of clay at Upsala. In the same way the order of succession of beds of iron-bearing can be determined. It appears therefore that accurate magnetic surveys would be of great value to the geologist, as well as to the miner. The value of the improved methods in the exploration and development of iron ore districts cannot be over-estimated, and probably a great future is in store for them in solving questions of stratigraphical geology in districts containing magnetic rocks.

The Bristol Iron Mines.*

Although it is strictly within bounds to speak of the Bristol district as a comparatively new one, it is also a fact that ore has been known to exist in this region for some years. In his "Notes on the Iron Ores of Canada and their Development" (1874) B. J. Hartington, B. A., Ph. D., commented as follows:

"During the winter of 1872-73 several openings were made in deposits of magnetic ore on lots twenty-one and twenty-two of the second range of Bristol, Pontiac County, Quebec. The ore here forms a series of beds, interstratified with reddish syenitic gneiss and glistening micaceous and hornblende schists. The thickness of what appeared to be the most important and the upper-

between E. and W. and E. 30° N., the angle of dip being usually high.

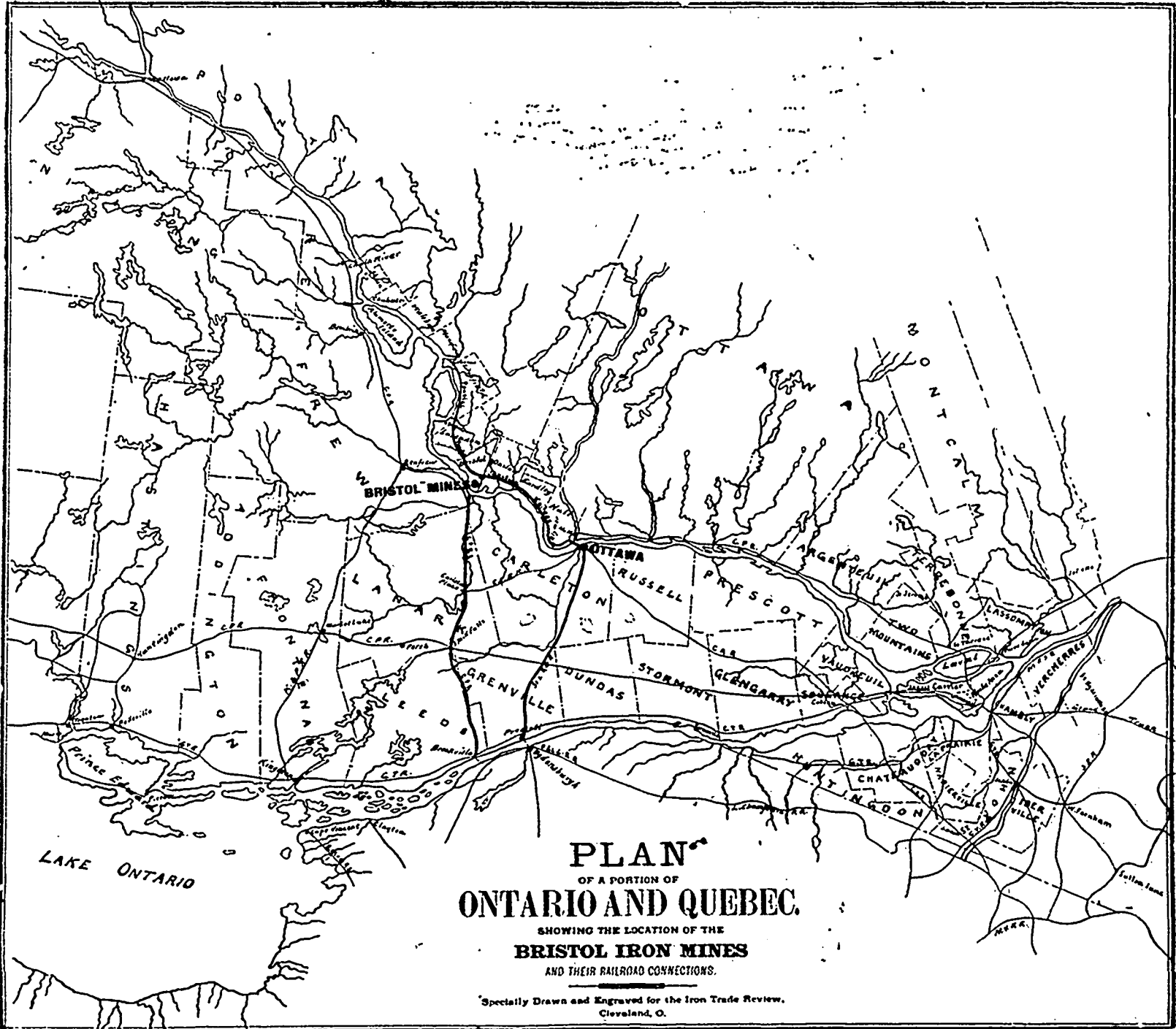
"The ore, though generally called magnetic iron ore, is really a mixture of crystalline magnetite and hematite, with a streak ranging in color from reddish to black. The specimen selected for analysis, and regarded as representing the average of what had been taken from the largest excavation up to July last, was rather finely granular, of a dark steel-grey color, and readily attracted by the magnet. The streak varied from reddish-brown to black in places. Scattered here and there through the mass were nests of pyrites, some of them nearly a quarter of an inch in diameter, and with the glass disseminated grains of quartz and calcite could be seen. The specific gravity was 4.32, and the results of an analysis as follows:

Iron as peroxide.....	45.81
Iron as protoxide.....	11.23
Iron as bisulphide.....	1.28

Total metallic iron..	58.37
Sulphur.....	1.46

"Combining a sufficient quantity of the peroxide of iron with the protoxide to form magnetic oxide, we find the ore to be a mixture of magnetite and hematite, in the proportion of 46.72 of the former to 33.22 of the latter (1.40: 1).

"The Bristol mine was first opened in January, 1873, and work continued with eight or nine men until September. The ore raised during that time amounts to about 4,000 tons, and still lies at the mine awaiting shipment. At the time of my visit in July, the largest



PLAN
OF A PORTION OF
ONTARIO AND QUEBEC.
SHOWING THE LOCATION OF THE
BRISTOL IRON MINES
AND THEIR RAILROAD CONNECTIONS.

*Specially Drawn and Engraved for the Iron Trade Review, Cleveland, O.

most bed could not be ascertained at the time of my visit in July last, as the opening upon it was nearly full of water; judging, however, from the quantity of ore taken out, the thickness must be considerable. Besides this bed, three others have been exposed by stripping; one of them was two feet thick, another only a few inches, but underlain by occasional small lenticular patches of ore, while the fourth appeared to be about nine or ten feet thick, so far as the small amount of work done enabled one to judge. The micaceous and hornblende schists in which the last mentioned bed occurs strike approximately east and west, dipping northward at an angle of only 35°. The general strike of the rocks as observed in the country for several miles east of the mines varies

Peroxide of iron.....	65.44
Protoxide of iron.....	14.50
Bisulphide of iron.....	2.74
Protoxide of manganese.....	0.11
Alumina.....	0.60
Lime.....	3.90
Magnesia.....	0.45
Silica.....	11.45
Carbonic acid.....	1.64
Phosphoric acid.....	traces.
Titanic acid.....	nene.
Water.....	6.14
Total.....	100.97

opening which had been made was 35 feet long, 24 feet wide, and about 20 feet deep, and from it about 1,500 tons (estimated) of ore had been extracted."

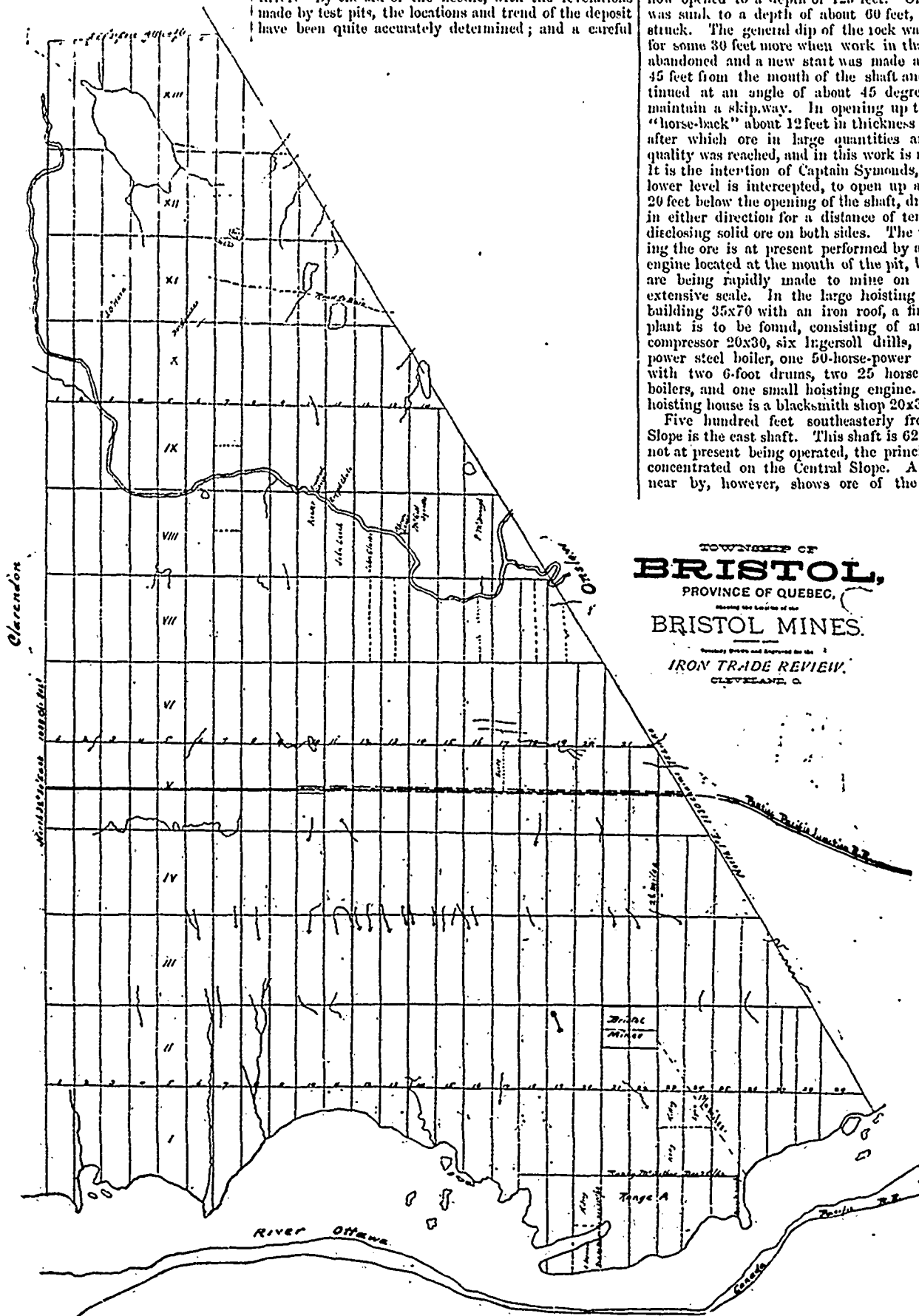
In 1881 the mine was in the hands of Mr. A. H. Baldwin, who also owned the Forsythe mine. Mr. Baldwin subsequently sold the property to Colonel Roberts, of Charlotte, and it was for some time operated jointly by that gentleman and Capt. C. C. Symonds, an old and experienced Cornwall (England) and Lake Superior mine captain. Colonel Roberts dying, operations were suspended until December, 1886, when the property was acquired by a wealthy and influential syndicate composed of the following gentlemen: Mr. Robert Blackburn, of Ottawa, retired merchant and extensive miner

and exporter of phosphates; Mr. Hiram Robinson, of Ottawa, President of the Upper Ottawa Improvement Company and one of the principal owners of the Kingston & Pembroke iron mining properties; Mr. Charles Mugee, largely interested in Ottawa real estate and Vice-

property by the writer last week showed the following to be the present stage of development:
The property controlled by the syndicate consists of 400 acres, lying in Bristol Township, Pontiac County, Quebec, one and a half miles northerly from the Ottawa River. By the aid of the needle, with the revelations made by test pits, the locations and trend of the deposit have been quite accurately determined; and a careful

northwesterly and southeasterly. On the north vein is a test-pit 20 feet in depth, from which a considerable quantity of ore has been taken. The most active operations, however, are on the south vein. About the centre of the property is located the "Central Slope," now opened to a depth of 125 feet. Originally a shaft was sunk to a depth of about 60 feet, when rock was struck. The general dip of the rock was then followed for some 30 feet more when work in that direction was abandoned and a new start was made at a point about 45 feet from the mouth of the shaft and the slope continued at an angle of about 45 degrees, in order to maintain a skip-way. In opening up the new slope a "horse-back" about 12 feet in thickness was penetrated, after which ore in large quantities and of excellent quality was reached, and in this work is now proceeding. It is the intention of Captain Symonds, as soon as the lower level is intercepted, to open up a slope. About 20 feet below the opening of the shaft, drifts were driven in either direction for a distance of ten to fifteen feet, disclosing solid ore on both sides. The work of elevating the ore is at present performed by a small hoisting engine located at the mouth of the pit, but preparations are being rapidly made to mine on a much more extensive scale. In the large hoisting house, a frame building 35x70 with an iron roof, a first-class modern plant is to be found, consisting of an Ingersoll air-compressor 20x30, six Ingersoll drills, one 100 horse-power steel boiler, one 50-horse-power hoisting engine with two 6-foot drums, two 25 horse-power portable boilers, and one small hoisting engine. Adjoining the hoisting house is a blacksmith shop 20x30.

Five hundred feet southeasterly from the Central Slope is the east shaft. This shaft is 62 feet deep but is not at present being operated, the principal work being concentrated on the Central Slope. A large stockpile near by, however, shows ore of the same uniform



President of the Bank of Ottawa, and Mr. C. C. Symonds, above referred to.

With characteristic enterprise the syndicate began immediately to resume developments on the property where they were left off by Colonel Roberts. Captain Symonds was put in charge of the active operations, and the work already accomplished speaks volumes for his experience and common-sense. An inspection of the

traversing of the property with the needle tended to confirm the plan laid down by the owners in every respect.

There are, beyond doubt, two veins of iron ore—the north lode showing a width of 150 feet and the south lode a width of about 200 feet. These veins are from 250 to 300 feet apart and have been traced across the entire property of the syndicate. The general trend is

appearance as at the Slope. A short distance west of the Central Slope the vein seems to open out into a secondary seam terminating in a needle tests show that this seam, leaving the south vein, has a width of about 360 feet for a distance of about 110 feet in a southwesterly direction. Lying southeasterly from this vein or off shoot and connected by a narrow vein is the pocket referred to. This pocket is apparently about 350

feet long by 250 feet wide, and two test pits (one of them now being worked as a shaft, under sub-contract) fully confirm the indications of the needle. From the new shaft ore of even better quality than that at the Central Slope is being taken out.

The analysis presented in Mr. Harrington's paper, in 1874, though showing a very good quality of ore, scarcely does justice to the ore more recently taken out, as shown by the following analyses of picked specimens:

[By Dr. S. A. Lattimore, of Rochester (N.Y.) University]

Metallic iron.....	67.80
Silica.....	.02
Sulphur.....	none.
Phosphorus.....	none.
Titanium.....	none.

[By T. W. McKeon, of Youngstown, O.]

Metallic iron.....	66.50
Silica.....	5.50
Phosphorus.....	0.8

By B. N. R. Richards, of New York.]

Metallic iron.....	62.15
Silica.....	8.12
Phosphorus.....	.0075
Sulphur.....	.97

While the above analyses present a fair idea of the richness of the ore, and while considerable quantities are to be obtained with little or no sulphur, the fact is to be stated, and is acknowledged at the outset, that the great bulk of the product is too high in sulphur for successful use in the blast furnace before being calcined or roasted. A fair statement of the average percentage of sulphur would probably place it at from 1.5 to 2 per cent. The problem before the syndicate has been from the beginning, whether to roast the ores at the mines or at the furnace. They have finally decided upon the former course, for the present, and have now on the grounds the castings and fire-brick for two calcining furnaces after the patterns of Taylor & Langdon, of Chester, N.J.

The Taylor-Langdon furnace consists essentially of a series of ore chambers surrounding a central gas distributing chamber and arranged to receive their supply of ore from a common ore chamber at the top of the furnace. The ore chambers are provided at the bottom with shutters and gates for regulating the drawing of the ore. In practice, the ore has to be broken to the size of a man's fist. Gas fuel is used, and the admission of gas is controlled by dampers, so as to maintain at the circulating flue—where it meets the air for its combustion—and oxidizing atmosphere as far as possible. Since the elimination of sulphur is imperfect, even at a high temperature, while the ore is in contact with gaseous products of combustion, the ore is withdrawn from such contact as soon as possible after it has attained the necessary temperature. The construction of the kiln is such that the workman can control the process by having access to the ore during the whole time it remains in the kiln, especially in the hot zone. By this furnace the sulphur has been reduced to 0.10 per cent. but it usually runs 0.30 to 0.40 per cent. The New Jersey magnetites, which are principally roasted in the Taylor-Langdon furnace, are very hard and dense, carrying from 2 to 5 per cent. of sulphur as pyrites, and become very sticky as soon as any attempt is made to roast them at a high heat. The Bristol mine ores, on the other hand, are of a rather soft and friable texture, easily freed from sulphur, yet not disintegrating under heat. This peculiarity has been demonstrated in the kiln, and was also shown in the heating of a piece of ore in the blacksmith's forge on the ground last week. The cost of Anthracite (buckwheat size) at the mine is \$5 per ton. Six tons of coal will calcine 100 tons of ore, and the product of each kiln is about 50 tons per day. This kiln is now in operation at Chester furnace, Chester, Pa.; Edge Hill furnace, Edge Hill, Pa.; Phoenix Iron Works, Phoenixville, Pa., and elsewhere, and is doing good work. The Bristol mine syndicate is confident that the cost of roasting can be brought under 55 cents per ton. It is worth while considering, however, whether it might not be economy to transport the raw ore to a natural gas region, or to a cheap fuel center like Cleveland, and there roast them before consumption.

An examination of the two maps accompanying this article will show that, with comparatively little trouble or expense, the district can be brought into direct connection with the great consuming centres of New York, Pennsylvania and Ohio. To the north, a distance of only 2½ miles, runs the Pontiac Pacific Railroad connecting with the Canadian Pacific and running into Ottawa, thence direct to Prescott or Brockville, on the St. Lawrence River. It is understood that the Pontiac Pacific is willing to run a switch to the mines upon certain conditions as to shipment. Another valuable connection would be by the Canadian Pacific direct, which could be reached by a tramway running southeasterly 1½ miles, thence across the Ottawa River by ferry to Braeside, on the Canadian Pacific, reaching the St. Lawrence at Brockville. At either of the above points on the St. Lawrence, barges and schooners can be loaded direct for

Cleveland and Lake Erie ports. Crossing the St. Lawrence rail connection can be had to New York and Eastern Pennsylvania furnaces. The distance to market are as follows: From the mines to Billerica, on the Pontiac Pacific Railway, 2½ miles; from Billerica to Ottawa, 40 miles; from Ottawa to Prescott, 51 miles; from Prescott to Cleveland, 412 miles; total, 535½ miles. The route by Braeside and the Canadian Pacific Railway is about the same. The distance of the Gogebic mines from Cleveland is 858 miles (60 miles rail, 798 miles lake). The Vermillion mines are slightly further, while Marquette and Menominee are nearer.

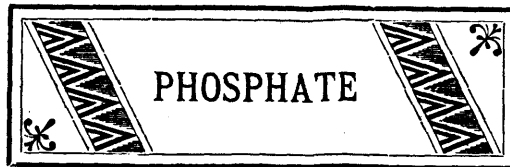
From data based on actual experience, as well as from propositions now in the hands of the syndicate, we make the following estimate as to the cost of mining and marketing the ore:

	Per Ton.
Cost of mining.....	\$.50
Roasting.....	.55
Handling at the mine.....	.15
Rail freight to the St. Lawrence.....	1.00
Loading.....	.25
Lake freight to Cleveland (including unloading).....	.90
Duty.....	.75
Agent's commission, insurance, interest, etc.....	.15
Total.....	\$4.25

Ore of this grade, free from sulphur, is now selling in Cleveland at \$6 @ \$6.50. With increased handling facilities at mine and river, the cost would be reduced to but slightly over \$4.00 per ton.

The gentlemen comprising the syndicate have embarked in the enterprise not as a speculation, but solely on business principles, and they propose to develop the property to its fullest extent. The mine is not for sale, but its product will be by next season. It is within the scope of the syndicate's plans to smelt the ore at the mines, but this is a matter for future consideration. The new Canadian tariff doubles the previous rate on pig iron, placing it now at \$2 per ton, and affords ample protection. The present consumption in Canada is equivalent to 250,000 tons of pig iron, leaving steel rails out of the question altogether; so that, under the new tariff, an immediate and steady home market is assured. With a continuance of the same intelligent and progressive management as in the past, there is no reason to doubt that the new district will soon take a most important rank among the iron producing districts of the Dominion.

*Reproduced with alteration and slight correction from an article published by the *Iron Trade Review*, Cleveland, Ohio. We are also indebted to the management of that excellent journal for the use of the plates.—Editor.



The following shipments of Canadian ore have been made from Montreal for month ending 31st July, 1887:—

Date.	Shippers.	Ship.	Destination.	Tons.
July 5	Wilson & Green.	s.s. Henry IV.	London....	199
6	Lomer, Rohr, & Co.	s.s. Carropus	Liverpool..	335
13	"	s.s. Westcum-berland	London ..	162
19	"	s.s. Dacona....	do	185
19	Gillespie Paterson	do	do	116
21	Lomer, Rohr, & Co.	Bar. Jeda	Montrose..	50
22	"	s.s. Ausley...	London....	336
21	"	Bar. Beltrees	Fleetwood..	190
28	"	s.s. Cremorn	Hamburg..	220
29	Wilson & Green.	s.s. City of Lincoln	London....	308
			Total....	2,191

A new company under designation of the United States and Canada Phosphate Mining and Fertilizing Company has been organized at Hallowell, Me., with a capital stock of \$200,000. Two hundred acres of mining lands have been purchased near Buckingham, and the new company proceed at once to mine phosphate and manufacture fertilizers.

A scheme is stated to be on foot in Montreal to open a new field for the utilization of phosphate. One of the proposals is to obtain possession of the Montreal abattoirs with a view to mixing dried rock with the tannage and thus produce at once a very powerful manure.

Advices from the Canadian phosphate mines continue satisfactory, the output continuing fully up to expecta-

tions. Prices in England and on the Continent range pretty much as previously, while the outlook for sales of Canadian crude phosphate in the United States market continues to improve.

The two lots which the Union Phosphate & Land Co. have lately opened up on Silver Lake give every indication of turning out well. A steam drill, hoisting engine and other improved machinery, along with a force of about twenty men, are employed. The Star Hill Mine is turning out its usual monthly output.

The output from the High Rock Mine for the past month will figure about 625 tons high grade ore. Most of this has been taken out of pit 2, which is undoubtedly one of the finest pits at present operated in Canada.

Mr. Wm. Pickford, sr., one of the owners of the mine, who has been residing on the property for several mouths, has returned to England.

Major Turnbull and Mr. Thomas Trimble, of Montreal, who are largely interested in the Templeton and Blanche River Phosphate Mining Company, paid a visit during the month to their newly acquired property at Templeton. They express themselves as much pleased with the outlook of the company.

The North Star Company have purchased a new 40 horse-power boiler which will greatly facilitate the further sinking of their shaft which has now reached a depth of 620 feet.

Mr. Franchot, manager of the Emerald Mine, informs us that the usual output of 500 tons was reached last month with a staff of about sixty men.

The mills of the Du Lievre Milling & Mining Company, at Bassin Du Lievre, are kept very busy grinding large quantities of lower grade ore from the various mines. We understand that the company are receiving large quantities from the Perth district.

Much dissatisfaction exists among the miners and business men with regard to the passenger service lately adopted by the Canadian Pacific Railway between Montreal and Ottawa. By the new arrangement visitors to the Capital from Buckingham must lose two nights and a day before they can return, while formerly they could transact their business and reach home on the same day. We understand that an endeavour will be made to effect a more convenient train service between the two points.

Operations are being conducted smoothly at the Little Rapids Mine. The energies of the staff have been directed to the ballasting and fixing up of the new tram line and other improvements on the property. Bush fires in the neighbourhood have proved troublesome, and numbers of men have been constantly employed for several days cutting down timber and taking other steps to remove the buildings on the property from danger. In consequence of these the output for the month has been somewhat below the average.

On Thursday, 11th instant, a representative of the REVIEW paid a visit to the Buckingham district with the object of visiting all the mines now in operation on the Lievre. Little Rapids was the first property visited, and here, through the courtesy of the superintendent, Mr. George R. Smith, we were taken down the shaft, which has now attained a depth of some 212 feet. A close inspection of the various levels revealed an immense body of high grade ore. We were next conducted to the engine and pump houses, where nothing but the newest and most improved machinery is being operated; the stores, cobbing houses, and the other buildings on the property were also visited. Everywhere one could not fail to be impressed with the careful, systematic and orderly manner which characterises the working of this mine.

It was our intention, on returning from the other mines further up the river, to have made a longer and closer inspection of this property, but as the sequel shows this was not to be.

In company with Mr. James White, of the Geological Survey, who has been located in the district during the summer making a topographical survey of the phosphate region, and Mr. A. May, of Ottawa, who had accompanied us on our visit, we started on our return to the Landing. Near by stood one of the ordinary box trucks used for carrying the ore over the new tram line, and to facilitate our progress, for the road was soft and slippery, we mounted this car, which, by the way was loaded with

rock, and started her down the hill. Mr. White was operating the brakes in front and the REVIEW man and Mr. May were standing on the small platform in rear. At first all went well, but on reaching the first grade the brakes, through some unexplained reason, failed to hold, and gaining impetus at every yard the car shot down the hill with terrific speed. With a roar like thunder we swept round curves and down grades in the most appalling manner, until about half way down the hill, fortunately on one of the best pieces of track, the car left the rails, and after running several yards along the ties crashed over on its side. The occupants were all thrown violently to the ground. Mr. White, upon whose foot the car fell, sustained a severe fracture to his right leg was cut about the face and badly shaken. The REVIEW man was more fortunate, escaping with a simple fracture to the left arm and a little shaking up. Mr. May was uninjured. The wonder is that all three were not dashed to pieces. Intelligence of the accident was at once conveyed to Buckingham and five hours later Dr. Wallace arrived and had the injured promptly attended to. The thanks of the party are due to Mrs. Platt, who was unremitting in her kindly attention to the injured, and to the sympathetic band of stalwart miners who worked so hard for their comfort. No blame can be attached to anyone for the unfortunate occurrence.

The Du Lièvre is rapidly falling but no actual work has been accomplished on the new lock and dam at Little Rapids. The contractor has pitched his tents on the ground, built himself a "bathing house," and brought up some material; but the powers that be have set a "nigger on the fence" to show how such things are done, and NOT done.

On Wednesday 10th inst., a special meeting of the Ottawa County Council was held for the purpose of settling the dispute which has long existed between the West Templeton Township and the Canada Phosphate Company, relative to the payment of taxes on a proposed new road running through lots 16, 17 and 18, range 8, and which the company affirmed they would never use and could not legally be taxed for. On the other side it was argued that the township could not make a new road on the concession line, as a hill of sand would have to be excavated at an enormous outlay. The phosphate company own lots 16, 17 and 18, range 9, and as the township affirm should pay a proportionate part of the taxation. The question was debated for some four hours before the ayes and nays were called for, which, when taken, resulted in a tie. Mr. Cormier, as Warden, gave his casting vote in favour of the company.

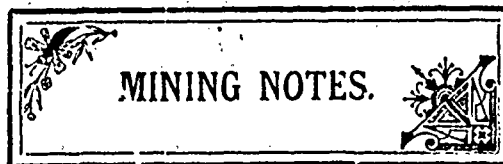
The phosphate and other deposits discovered by Mr. John Frost in the rear of the Township of Litchfield, specimens of which he had examined by Mr. Obalski, the mineralogist, have been pronounced the best shown him in Pontiac.

Mr. Alex. Johnston, who has purchased a half interest in the O'Brien Phosphate Mine, put in three blasts recently with the result that the mineral turned out better than was expected. He contemplates putting on a force of men this fall when the extent of the development will be ascertained.

Mr. Sharp has discovered phosphate on his farm in Bristol, specimens of which has been left at the office of the Crown Land Agent for examination by the mineralogist.

The simultaneous manufacture of these two valuable fertilizing products, assimilable phosphates and sulphate of ammonia, has been facilitated by a process lately patented by Mr. E. Salvoy, of ammonia-soda renown. It consists in adding to superphosphate of lime, during its manufacture, ammonia and carbonate of ammonia, so as to produce a complete manure in which the nitrogen is fixed without any additional acid. When phosphate of lime is attacked by sulphuric acid, almost insoluble sulphate and soluble monobasic phosphate of lime are produced, and this mixture constitutes the usual superphosphate of commerce. These two salts may be separated by filtration, or they may be left intermixed. By the new process, a very large portion of the acid employed for this purpose may be economized or recovered by combining this manufacture with that of ammoniacal salts, for, if ammonia be placed in presence of monobasic phosphate of lime, an insoluble bi-basic phosphate of lime and phosphate of ammonia are formed. The phosphate of lime obtained has an agricultural value equal to that of superphosphate, and in addition, phosphate of ammonia is obtained, which is very valuable for agricultural purposes. If it be preferred to obtain all the phosphoric acid as phosphate of ammonia, the phosphate of lime (bi-basic) is treated over again by

sulphuric acid. If it be preferred to obtain all the phosphoric acid in a state of phosphate of lime, the phosphate of ammonia is treated by a suitable salt of lime.



Nova Scotia.

A gold mine, known as the Hall Owens property at Caledonia, N.S., was recently sold to an American Company for \$25,000.

The Eastern Development Company (Limited) has received a diploma and bronze medal for its exhibits at the Colonial and Indian Exhibition held lately in England.

There is, says the *Critic*, very little new to report in regard to the gold mines of the Province. All the old properties are being worked to their utmost capacity, but new finds of value are rarely heard of. Coal mining is in a flourishing condition, and the Spring Hill Mines have just closed a large contract with the Grand Trunk Railroad. Nothing new has been received in regard to the opening up of the iron deposits under the stimulus of the new tariff; but the air is full of rumors of proposed works. We should like to see active operations commenced, as the summer season is now half over; and if something is not soon done, another year will have to elapse before smelting works can be built. In New Brunswick, the mining outlook is most promising, and new discoveries of valuable minerals are reported from several sections of the Province. The wild speculative period of mining has been passed over, and, under wise and competent management, assisted by greatly improved mining machinery, profitable returns are the rule, and we hear of no failures.

The mines on Gold River are being worked as usual, but the water supply for crushing is short at this dry time. Quartz, however, of a good quality is being taken out, and will be all ready for the first rain, when we hope to hear of that mill taking lots of the precious metal from the quartz now being raised to the surface.

Quebec.

There is nothing new to report from the Villeneuve Mica & Mining Company's mines. The work of cutting and sorting the mica is being steadily pursued and the management at Buckingham is kept very busy filling large orders from Canadian and American consumers.

Ontario.

Our Sudbury correspondent sends us the following particulars of recent operations at the mines of the Canadian Copper Company.—At the Copper Cliff Mine there have been put in two 50 horse-power boilers, made by John Doty Engine Co., Toronto, which furnish steam for a small double hoisting engine, built by Webster, Camp & Lane Manufacturing Company, of Akron, Ohio, and one three-drill air compressor, made by Ingersoll Rock Drill Company, of Montreal. A ten horse-power portable engine drives a Beckett & McDonald rock breaker, which has a capacity of crushing eighty to one hundred tons of ore per day. After passing through the crusher the ore and waste rock are separated. A two compartment shaft, with shaft house and rock house, are being built; the former nearly completed. At the Stobie Mine the earth and detached waste rock are being stripped from the surface, thus exposing the ore. A vertical shaft is being sunk to strike the vein at about 450 feet from the base of the hill, which has now reached a depth of 72 feet. At this mine a three drill compressor and one crusher are in operation, together with a small hoisting engine at the shaft. The company have secured the services of Dr. George Stewart, a late graduate of the Toronto School of Medicine, as physician and surgeon for the miners and their families. On Tuesday, the 2nd instant, the Hon. Alex. McKay, Mayor of Hamilton, Ont., with a party of about twenty aldermen of that thriving city, made a brief visit to the Stobie Mine.

The *Nipissing Times* will shortly contain a series of articles on Mineralogy and Prospecting from the pen of a distinguished mineralogist. The object in view is to enable its readers to discover for themselves the various economic minerals which are said to exist in abundance in the Mattawa district.

Local exchanges announce the discovery of anthracite coal on the property of Mr. Nix, a farmer, living about nine miles east of Campbellford. Samples were found by Mr. Nix some years ago, but he paid no attention to the matter until Dr. McCrea, of Campbellford, interested himself in the case.

We understand that the Kaladar gold mining property, owned by Napanee parties, has been sold for \$12,000. Mr. Peter McLaren, of Perth, is one of the purchasers.

Mr. N. J. Ritchie, president of the Central Ontario Railway, will shortly commence work at the Baker iron mine.

PORT ARTHUR DISTRICT.

The *Miner* has been incorporated with the *Weekly Herald*. The paper will hereafter be known as *The Algoma Miner and the Weekly Herald*.

The Rabbit Mountain Mine is still under course of development, under the management of Dr. Lehman, of St. Paul. It is only fair to say that had the company, which own this property, adopted the vigorous policy pursued by their neighbours at the Beaver Mine; they would to-day have probably as much ore in sight. Under Dr. Lehman the shaft at this mine has been deepened 100 feet, which gives a total depth of 240 feet. For the last 70 feet of this distance a fine streak of silver shown continuously along the foot wall of the shaft. Drifts from the shaft in both directions are being driven at the bottom, and at fifty feet above it, with most encouraging results.

Silver Mountain, east end, is looking particularly well at the present time. The west, No. 3, shaft has been sunk 125 feet and good silver struck. This is the shaft to sink which new machinery has been put down and recently got in operation, and they are now prepared with all the appliances to go down 1,000 feet. In this shaft the pay streak is 3 feet wide and assays show \$90 of silver per ton. In stope drift No. 5 the pit is showing up good about 30 feet down, and this, with the large amount of undeveloped ground to the west toward the new shaft, leads to the conviction that there is plenty of good ore to be had in Silver Mountain, east end. They are just now shipping in sacks the smelting ore to Liverpool. Capt. John Trethewey has resigned his position as superintendent of the mine and Capt. Thomas Trethewey takes his place, the change having gone into effect on the 1st instant.

The Ontario Silver Mining Company, of St. Paul, are working a short distance east of the Badger, and according to reports, are delighted with their investment.

The presence of R. G. Peters, of Manistee, Mich., in the city, and the knowledge that he is chief owner in the wonderfully rich Beaver Silver Mining properties, but lately developed, sent a News representative after him to glean, if possible, a few facts regarding his exceedingly profitable investment. It was learned that there are now 144 men employed at the mine, which is 28 miles southwest of Port Arthur on the Canadian North Shore of Lake Superior. The mine owners are now shipping away about \$10,000 worth of ore daily, none of which has a lower assay value than \$1,500 per ton, and much of it a great deal higher. Mr. Peters has with him a little fragment of native silver weighing 60 pounds, which has an assay rating of \$15,000 per ton. The property is being rapidly developed, and 350 feet of shafts have already been made, and 2,300 feet of cross drifting has taken place, with the result in every instance of increasing the visible amount of rich ore in sight. The gentlemen who own the mine are increasing the machinery and appliances for reducing the ore more rapidly, less expensively and with far less waste than heretofore.—*Duluth News*.

The prospect at the Queen Gold and Silver Mining Company's location is good, and all the developments only give more certain evidences of the value of the location. Mr. Kimball has made a big cut 20x20 feet on the junction of the two veins and here he intends to sink the shaft. From the shaft they will be able to drift four ways.

In the immediate neighbourhood of Port Arthur are vast deposits of silver and gold now being worked, and towards the frontier line is an extensive region of iron ore. The Port Arthur, Duluth and Western Railway will accommodate a number of these mines, and, passing through the iron regions, will connect with the Duluth and Iron Range Railway, forming a direct route to Duluth, St. Paul, Minneapolis, and the Northern

Pacific Railway. Within three miles of Port Arthur is Fort William, on the Kaministiquia River, navigable for ten miles, on which the Canadian Pacific Railway has extensive dockage and warehouse property. Port Arthur, with its piers, where the lake steamers arrive and depart with passengers and goods, and Fort William, where the freight traffic is transacted, have but a narrow mile or two between, and must be linked together as one city—the Port Arthur of the future.

British Columbia.

The Silkirk Mining and Smelting Company, of Illecillewaet, shipped their first car load of ore on the 25th ult., to the smelting works at Denver. The shipment consisted of fifteen and a half tons of tested ore, having an assay value of 2,120 ounces of silver. The company have the privilege of drawing on the smelting works for ninety per cent. of this value on its being forwarded. An assayer holding the confidence of the Denver company states the value of the ore, he having made tests that enable him to do so. On the lead nothing can be drawn until it has been smelted. The work on the four ledges owned by this company is progressing favourably, and it is hoped that in course of a short time they will be in a position to turn out ore at the rate of two or three carloads per week.

Hixon creek is still being developed, the company confining their efforts to sinking on the shaft which is constantly improving in quality of rock.

The Rock creek gold fields on the border are getting more prominent every day for the extent and richness of its mineral. The Amelia is one of the seventy-five or more locations about five miles from Rock creek on elevated table land. Two shafts are being sunk, one of them is down forty feet and shows a fine body of ore. A thirty foot cross-out has been made on the other fifteen foot shaft and no foot wall is found. The surface croppings are rich with free gold and as it is penetrated it becomes rich in sulphurets.

Mr. John Ross, the well known railway contractor, has become the owner of a silver mine on Illecillewaet river, which promises to be very rich, judging from the assays that have been made from its ores. Mr. Ross has purchased two of the most improved crushers, and these will be taken out shortly and placed in position. The mine is distant about one mile from the railway track and is located away up on the steep mountain.

Mr. John B. Farish, of Denver, Colorado, a mining engineer who ranks among the first in America, has been retained by the British Columbia Milling and Mining Co. and the Island Mining Co. to examine their mining properties in Caribou. It shows wisdom on the part of the above companies to retain a mining engineer of known ability, instead of trusting to one whose only recommendation may be cheapness. The B. C. and Island Mountain will thus secure positive information as to the proper treatment of their properties and though it is rather expensive at present, it is bound to prove the most economical in the end.

The Vancouver Coal Mining and Land Company's mine was discovered in the early days by the employes of the Hudson Bay company, and has been operated since 1851. Its coal has been used by the San Francisco Gas company for the past thirty years—a striking testimony to its merits. There are always several hundred men employed at the mine, which is one of the largest on the Pacific coast, and produces some of the best coal in the world.

The total area of the Wellington Estate, operated by the Vancouver Coal Company, comprises 2,417 acres. Messrs. R. Dunsomier & Sons have constructed a railroad a little over four miles in length, the greatest grade of which is 1 in 30, and the greatest curve 88; this bringing the mines to the water's margin. The daily output averages about 800 tons, 17,000 tons per month being shipped to San Francisco, San Pedro and other ports along the coast.

For domestic use the Wellington coal has been held in high favour from the earliest period of its introduction, for the reason that the most careful analysis has thus far failed to discover in it the slightest trace of sulphur, consequently it contains neither gas nor cooke. For steam vessels and industrial purposes it is especially fitted, and to that use it is largely supplied. For more than eighteen years these mines have been operated upon a scale commensurate with the demand for the character of coal produced by them, supplying a rapidly growing trade from Vancouver Island to Mexico, and stretching far out into the Pacific Ocean to Hawaii, and yet the door of these coal fields is but fairly open.

Alaska.

Considerable excitement prevails in mining circles over the reported rich discoveries in the Silver Bay district near Sitka. The Lake Mountain Mill company has struck the ledge on the Lucky Chance location by continuing the same tunnel run under the management of B. R. Crowles. A quartz mill will soon be put in operation.

Mining developments and rich strikes from the Berner Bay district are constantly being reported.

The United States steamer Pinta has returned from Chilcoot to Sitka and reports everything quiet in that vicinity; also that the miners in the Yukon country are doing well so far as heard from.

NOTICE TO SUBSCRIBERS.

Readers of the REVIEW who may be residing out of town during the summer months can have their copy mailed to their new address on communicating with the office.

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TOWNSHIP OF ASCOT.

- 1st. Clark Mine, Lot 11, R. 7 Ascot 187 acres.
- 2nd. Sherbrooke Mine, part Lots 12 and 13,
R. 7 Township of Ascot 329 "
- 3rd. Belvidere Mine, part Lots 9 and 10, R.
9 and 10, R. 8 Ascot 292 "
- 4th. Mining Rights in same vicinity on 250 "

All of the above properties lie within 1½ miles of the Village of Lennoxville, at the junction of the Grand Trunk, Canadian Pacific and Passumpsic Railways, and have been developed to a considerable extent, and veins opened 6 to 20 feet in width, yielding 3 to 5 per cent. of copper, also silver, and 35 to 40 per cent. of sulphur. These mines are only 2½ to 3 miles distant from the City of Sherbrooke, and evidently are of the same class of ores found at Copelton, only four miles distant, owned and worked by the Orford Copper and Sulphur Company, and by Messrs. G. H. Nichols & Co., of New York, which have proved so remunerative.

TOWNSHIP OF ORFORD.

- 5th. Caruncle Hill Mine, Lots 2 and 3 R. 14, and
2, 3, 4 R. 15, 718 acres. Same class of ore as is found
in the Ascot properties above described, but yielding a
higher percentage of copper.

TOWNSHIP OF CLEVELAND.

- 6th. St. Francis Mine, ¼ Lot 25 R. 12, 50 acres, with
dwelling houses, smith's shop, ore sheds and office, large
winding and pumping steam engine, with boiler, winding
and pumping gear, and about forty fathoms Cornish lifting
pumps complete, railway tracks, ladders, etc., situated
three miles from Grand Trunk Railway. A considerable
amount of mining work has been done at this mine.
A well defined vein richly charged with vitreous purple
and yellow sulphurets of copper traverse the entire
length of the property, five feet in thickness, yielding 8
to 40 per cent. metallic copper.

TOWNSHIP OF GARTHBY.

- 7th. Fifty-six lots of land, 2,938 acres. This prop-
erty for the most part is unexplored, but copper is found
on the greater part of the property. On one of the lots
a vein about twenty feet in width has been found.
Samples of the ore have yielded as much as 22 per cent.
of copper, being also rich in sulphur. Other samples of
pyrites from the same property, free from copper, have
yielded as high as 48 per cent. of sulphur. The only
drawback to this property is in its distance from the
railway, it being about four miles from Garthby Station,
Quebec Central Railway. A new line is chartered,
however, which, when built, will run directly through
the property.

TOWNSHIP OF ACTON.

- 8th. The Acton Mine, 100 acres, with engine, boiler,
pumps and appliances. Within three years after this
mine was first opened it produced nearly \$500,000
worth of copper. It is situated about half a mile distant
from the stations of the Grand Trunk and South Eastern
Railways.

- 9th. Brome Mine, part Lots 2 and 3 R. 4, 50 acres.
- 10th. Bolton Mine, two miles from Eastman Station,
Waterloo & Magog Railway, 400 acres.

The above properties formerly belonged to the Canadian Copper and Sulphur Company, and were acquired by the present owner at sheriff's sale, giving an indisputable title thereto.

The whole or any portion of the property will be sold at reasonable prices.

For further information apply to

WM. FARWELL,
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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, tin, 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 on 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.

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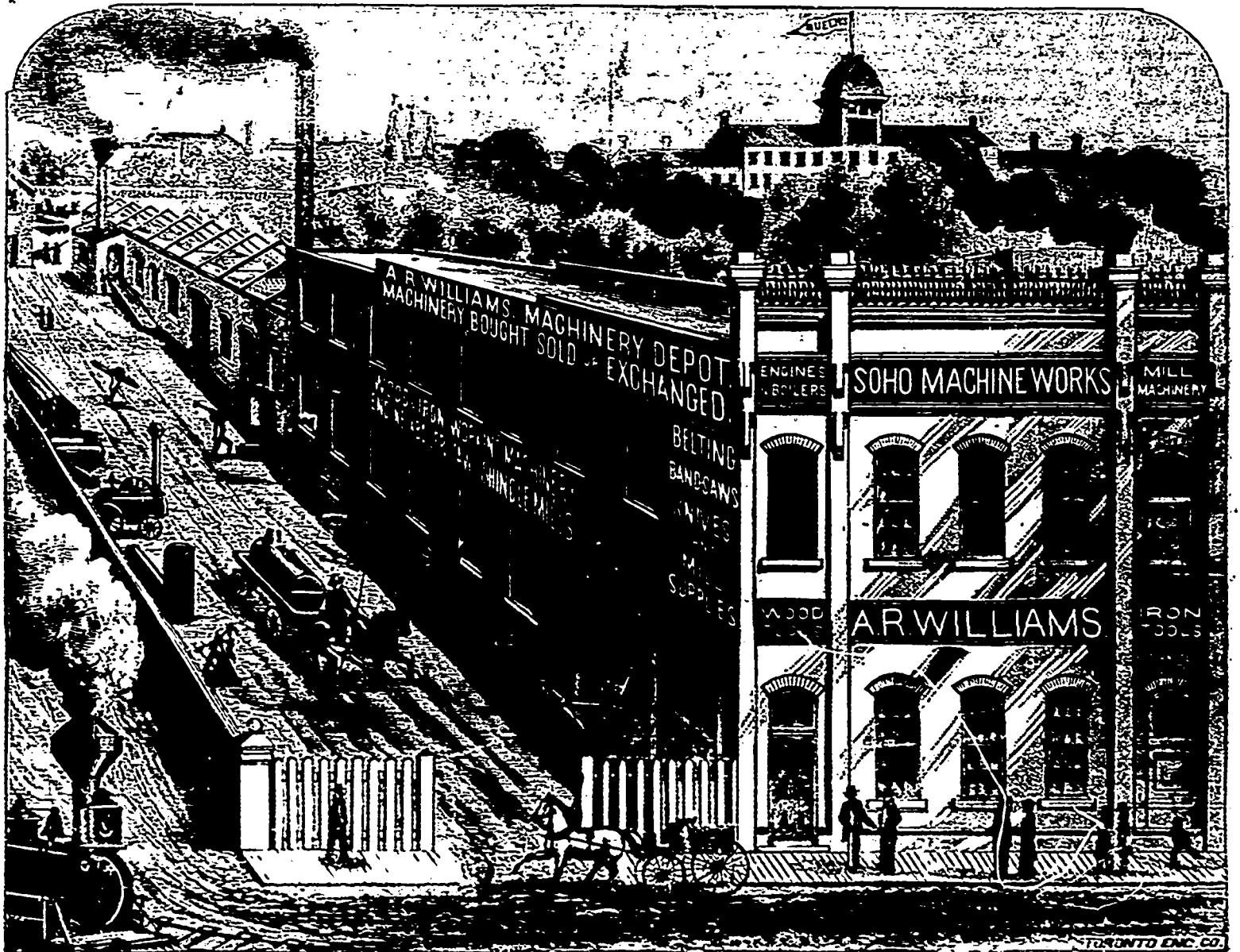
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