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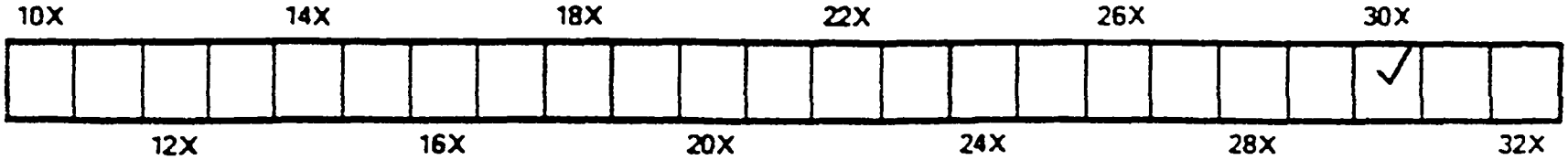

The Canadian Mining Review

Established 1882

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The Stanley Coal Heading Machine.—Mr. Stanley, of the Haunchwood Brick and Tile Co., England, has invented a new coal heading machine, which is at work both on the bank and in the mine. This machine is made to cut an annular groove around the face of the heading, leaving a core which either falls or is got off as the work proceeds. The machine can cut a heading in about one fourth of the time which would be occupied if the work was done by hand labour. It will cut through the hardest material, such as thin bands of ironstone, without difficulty. Experiments are said to have demonstrated in a satisfactory manner the utility of the machine.

The Most Ancient Tin Mine in the World.—The Great Work tin mine, West Cornwall, which has recently been reopened, is undoubtedly the most ancient mine in the world. It is recorded that the Phœnicians came here for tin, and the public records show that the mine has been worked, with slight intervals of cessation, for the past 300 years. The value of the property is indicated by the extent of the workings, upon which no less than £390,024 has been expended, whilst the ore produced realized on sale £628,706. Although no fresh ground was opened tin of the value of £100,000 and upwards has, during the past 20 years, been obtained from the surface and shallow workings. The contents of the prospectus are interesting, showing, as they do, what this property, which is not more than 180 fathoms in depth, has done. The lift is a mile and three-quarters in length, on the course of the lode, and in some places a mile in width, embracing an area of 720 acreas. Underground the levels have been driven in the aggregate about 30 miles.

The use of Steel Suports in Mining.—In a paper recently read by Mr. A. L. Stevenson, M.E., before the North of England Institute of Mining Engineers, it was stated that the result of a trial on a large scale of steel beams in the iron mines in the Cleveland district was entirely favourable to their adoption from the points of both economy and security. In the mines in question the expenditure for timber is about $50,000 a year, even when not working full time, and the average life of the timber in consequence of dampness was not more than two years. Out of nearly 200 tons of steel now in use only one beam has failed, and it is demonstrated clearly that in strength the advantages gained where the roof is heavy are marked, fewer pieces being required and a much better and neater arrangement can be effected with a clearer road, owing to the smaller size and number of props. After an experience of three and a half years the work seems to be in perfectly good condition, so that permanence is effected instead of frequent renewals. Including the packing material and all labour, the average cost of six steel board end crossings was £5 4s. 1d., for timber, or an increase of 36 per cent. which increased cost is considered amply compensated by the advantages gained

The Deepest Coal Mine.—The Saint-Andre du Poirier mine claims to be the deepest coal mine in the world. It has a royalty of 864 acres and a yearly production of 200,000 to 250,000 tons. There are two coal drawing shafts, the one 2,952′ deep, the other 3,083′ deep. The first shaft is being deepened to 3,149′. Each of the pits is being ventilated by a Guibal fan working in a second shaft. A remarkable feature in the workings at these mines is the comparatively low temperature experienced. The maximum temperature is 75° F., and it is very often considerably lower; the air passing along the "face" is not warm. This tends to show that elevation of temperature is by no means the greatest obstacle in working very deep mines. The four seams worked at Saint-Andre vary from 1′ 8″ to 2′ 7½″ in thickness; the working faces are 50′ wide. The daily output per underground workman is eighteen hundredweight. It seems that with an average selling price of 7s. 1½d. per ton, the mine makes a profit varying from 9½d. to 1s. 9d. per ton. This is a striking testimony to the efficiency and economy with which the operations must be conducted. The daily output of the Saint-Andre shaft is from 300 to 350 tons. This is an old shaft, only 9′ 10″ in diameter. It has been sunk in several stages as the upper seams became exhausted. It is provided with wooden guides, and six tubs are lifted at once. The winding is done with flat steel ropes, of non-tapering action, weighing 20 lbs. per yard. Ropes of the tapering sections were formerly used, but were found liable to break at the change of section. The ropes are wound on ordinary drums. The ascending speed is at least 33′ per second, 120 tubs being lifted per hour. The engine is verticle, with two cylinders and 400 horse power.

Abusing Machinery.—There is no economy in running machinery for all it is worth, without proper care in cleaning adjusting and oiling. It is not the greatest amount of work which can be got out of a machine in a given time that always constitutes good economy, but the greatest amount of work with the least wear and tear. Over-speeding is one of the faults, but because over-speeding beyond a certain limit to the manifest injury of the machine is not considered good practice, it does not follow that there is good economy in reducing the feed below a speed which will render the machine incapable of turning out a reasonably good day's work. There is no more economy in pushing a machine beyond its powers of endurance without proper care in adjusting, oiling and cleaning, than there would be in constantly urging a horse forward with loads far beyond his strength, without necessary food and care. In either of the cases named the result will be practically the same.

A Progressive Canadian Province:—Fifty years ago the population of Nova Scotia was less than 200,000; in 1871 it was 387,800; in 1881 it was 440,572, and now it is estimated at 490,000. Its yield of coal has increased from a little over 100,000 tons in 1837 to nearly 1,500,000 in the past year; while even in spite of the development of iron ship building, its wooden ship building has increased four-fold in the past thirty years. Its fishery products have increased in fifty years from $895,000 to $9,000,000.

Steam Pump Practice.

By Hiram R. Jones.

[From the American Machinist.]

If a suction pipe is obstructed; too small or too long, the pump will be "starved," so to speak, and if the velocity of the plunger is greater than the inflowing water, there will be a partial vacuum formed between them, and on its return stroke the plunger will strike the advancing water with great violence, producing a severe shock and strain on the valves and joints of the pump and pipes.

A partial remedy for this evil is to put a large air chamber on the suction pipe near the pump. This will make an elastic cushion of air for the incoming water to come into contact with, and so not to strike the returning plunger with so hard a blow. But while a suction chamber is always an advantage, it will not stop the pounding if the average of the volume of water is not enough to follow in close contact with the plunger. In this case the proper remedy is to put in a larger suction pipe.

Many a good pump is blamed for not doing its work smoothly, when the only trouble is a restricted supply of water. In some situations, in order to bring the pump under the immediate charge of the engineer, it is necessary to use a very long suction pipe. In such cases it should always be one or two sizes larger than the pump connection calls for, and the water should flow to the pump from a head, or have a very moderate lift.

Should there be a leak in the pipe, so as to allow air to enter, the plunger will act something like the case just mentioned, but instead of the plunger striking with a solid blow, it will impinge against the air cushion formed. The first part of the return stroke will be very quick, but will gradually slow down to its normal speed as the imprisoned air is compressed, but without severe shock, as in the former case.

If the suction pipe is short and vertical, and has a leak in it, the pump will discharge about the same quantity of air at each stroke, but if it runs a long distance horizontally, and the leak is near the far end, the action of the pump will be spasmodic, sometimes getting solid water, and then great pockets of air will flow into it, causing it to dance back and forth for several strokes before it will get water again. If the pump is working against a heavy pressure, and there is much clearance, air will sometimes come in in such large quantities that the stroke of the plunger will not be sufficient to compress it enough to lift the discharge valves, and the return stroke will not expand it enough to produce vacuum enough to lift receiving valves. In this case, the action of the pump will be very much like compressing and releasing a spiral spring between the palms of the hands. When a pump works this way, engineers say "she has lost her water." Should this happen, close the valve in discharge pipe, and open the pet cock until the air is out, and water appears

As what is going on inside of pumps and pipes is hid from the sense of sight, our knowledge of their diseases depends very largely on the action of the piston, and the sounds produced—the causes of which we must reason out. We can see them only with our mind's eye. If pumps and pipes were transparent, we could see the air moving along always in the highest place it can find, like the bubble in a spirit level. Fill a glass bottle with water nearly full, cork it, tip it about in various positions, and the relative positions of air and water are readily seen.

I would suggest, right here, that makers of philosophical school apparatus make pumps and engines of glass, in order to show what is going on inside. Make long suction pipes, short ones, small ones, large ones; provide leaks in them in various places, to be controlled at will. Make vertical curves with elevations and depressions, to show how air traps impede the flow of water. In this way, the flow of water and pump action, can be shown, and much more clearly than it can be described without this aid.

All pumps with high lifts or long suctions should have a foot valve *just above the water level*, and have it so arranged that it can be got at for examination or repairs without breaking the pipe connections.

A primer is very convenient. It is simply a small pipe with a valve in it, connecting the discharge pipe with suction. By this means the pump and suction can always be charged and ready for instant use, should it stand for some time unused. It should be closed when pump is working.

It will also serve to detect leaks which might occur, and would not show up were there no way to put pressure on suction pipe.

A *very small leak* in a suction is an advantage, as it keeps the air chamber charged, which would otherwise become filled with water as the air became absorbed by it. In pumps that are perfectly tight—a rare occurrence—a pet cock should be provided below the receiving valves, to admit air occasionally, if the pump begins to pound.

Hot water or boiler feed pumps have diseases peculiar to themselves. When water is heated to about 100 degrees Fahrenheit it will begin to boil in a vacuum, and produce steam with an increasing pressure as the temperature rises, until the boiling point in the open air is reached, when the pressure of the steam will just equal that of the atmosphere. Now the sucking action—so called—of a pump is not such as to *pull* water into itself as you would pull a boat towards you with a rope, but simply to produce a partial vacuum by moving away from the water and allowing it to follow after, forced in by whatever pressure there may be on it, whether atmospheric or otherwise.

Water heated nearly to the boiling point in the open air has just pressure enough on it to keep it from producing steam. To show what would be the result of trying to pump this water, we will introduce a case in practice. Suppose that it is attempted to pump it from a heater or cistern, the water level of which is two feet below the pump. Now to force this water into the pump will require an additional pressure of nearly one pound on the surface of the water, or what would be its equivalent, the removing of the same amount of pressure from the surface of the water standing in the suction pipe. Suppose that we start the pump and remove nearly one pound of pressure as indicated. The result will be that the water immediately boils and produces steam, and we would pump steam instead of water. If the speed of the pump is increased slightly we pump both steam and water, and with not very smooth action either, for this steam, unlike the air, would be condensed by the returning stroke of the plunger, and what little water may have entered with the steam will be met with a blow like a steam hammer. The remedy is to raise the level of the water, or lower the pump so that the water will have some head or fall to pump. The action, as above described, will sometimes occur when the water level is as it should be, but suction pipe too long, too small, or contracted by valve elbows, etc.

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Foreign Analysis of Phosphate.

The most unsatisfactory feature in the Canadian Phosphate trade is the manner in which the quality of shipments made to Europe is determined. It is customary to sell the Phosphate with a guarantee that the quality shall not fall below a given standard. This was, in the earlier days of the industry, seventy per cent. of phosphate of lime, but the standard has been raised to 75 and 80 per cent., and any lot falling below that guarantee is rejected and then bought in, as a rule, at a lower price. By the time the quality is determined the phosphate is usually in the possession of the buyer and the seller is therefore at his mercy, for if the new terms are not accepted the cost of removing and reselling involve a loss perhaps greater than the reduction that is proposed. So great are the advantages of these rejections that the buyers are very strenuous for high guarantees; and the uncertainties of analyses give many chances to secure good bargains. Every shipper has his stock of grievances to relate and we know of one case in which, on a falling market, a loss of $3,000 was made on a single shipment in consequence of its having analyzed in England a trifle under the guarantee.

Probably there are few businesses in the world conducted on so radically unjust a basis. To send goods to a foreign land and put them into the hands of the buyer before their value is determined, is an act which must be characterized as folly when we consider that trade, under its present competitive conditions, is merely civilized warfare and each combatant is bound to take every advantage that law and custom will permit. The obvious course is to determine the quality before shipment, and to do this in a manner to satisfy the foreign buyer, it would be necessary to appoint a Government sampler and analyst. Ashes have an official inspector, although the total exports of this article from Montreal in 1887 were 3,384 barrels as against 20,349 tons of phosphate exported.

Many accusations have been made against the fairness of European sampling and analyses, and stories are related of the bribery of the men having charge of the selection of the sample. A careful investigation of the methods employed in sampling cargoes warrants the assertion that this is as fairly done as the recognized system permits, but as not more than two per cent., if as much, is ever taken for a sample, there remains a chance of variation which can hardly be obviated until the trade changes to the shipment only of pulverized phosphate,

We regret to say, however, that the accuracy of the analyses is often open to question. By observation of the certificates of various analysts it becomes known in time which of the chemists are usually more favorable or otherwise in their results and they become known as "high" chemists or "low" chemists. The sample from the ship is, as we have said, usually chosen impartially, the method being to set aside one tub, basket or bag in each hundred or fifty as may be decided upon, the men in the ship's hold having no knowledge as to the choice. After this reserved quantity is ground the buyer's, seller's, and agents send samples in sealed bottles to their respective chemists. Naturally the buyer chooses a "low chemist" and the seller takes a "high chemist".

A comparison of the analysis of the total shipments made in one year by a Canadian shipper is instructive. The results were as follows:

	Buyer's Chemist.	Seller's Chemist.
Cargo No. 1.....	80.99	82.52
" No. 2.....	73.58	76.10
" No. 3.....	74.57	78.14
" No. 4 (part).....	75.98	77.58
" No. 4 (balance).....	76.24	77.28
" No. 5 (part).....	79.43 77.89	81.21
" No. 5 (balance)	80.463	81.51
" No. 6.....	78.63	75.75 77.36

Thus in only one case out of eight were the buyer's chemists higher than the seller's. The differences show, in the first place, how great is the chance of variation and what risks are run by giving a high guarantee; and, secondly, these figures indicate either that chemistry is a science that discriminates in favour of the patrons of its priests, or else that wrong results on one side or the other are obtained. It is due to the eminent chemists concerned to say that they are above suspicion of unfairness, unless we may attribute to them an unconscious bias in favour of their employers, but we prefer to think that different methods of analysis are employed and the morality lies with the principals who select "high chemists" and "low chemists" to do their work, and after all this is only "business."

But we submit that this feature of the phosphate trade needs remodelling and that the determination of qualities should be placed beyond the influence of competition. Chemists should also agree upon some uniform method of analysis, so that a variation by two analysts of 3 to 4 per cent upon the same sample should not occur.

Prof. Sterry Hunt, in his paper read before the British Association on "The Study of Mineralogy," advocated a system of mineralogy based on the successive forms which are imposed upon matter: (1) The chemical form, or composition; (2) the mineralogical form, or physical state; (3) the crystalline form, being the most accidental.

LETTERS TO THE EDITOR.

We invite Correspondence upon matters consistent with the character of the REVIEW.
Be as brief as possible. The writers name in all cases required as a proof of good faith.
One dozen copies of the issue containing his communication will be mailed free to any correspondent on request.
We do not hold ourselves in any way responsible for the opinions expressed in this section of the REVIEW.

Natural Gas in Canada.

Ottawa, 2nd Nov., 1888.

The Editor

SIR,—My attention has been called to an article in No. 8, Aug. 24th, of the *American Manufacturer*, under the heading "LITTLE NATURAL GAS IN CANADA.

It appears to be a report of an interview with Mr. E. C. Beardsley, of Pittsburgh, who has been visiting the gas fields of Canada.

We are not informed what gas fields he visited, and he refers only to certain wells in the Province of Quebec.

He goes on, however, to say "There is no hope that there will ever be found in that country, any gas wells which would be considered at all valuable producers by the companies operating here." Now, this is, it seems to me, an exceedingly rash and hasty opinion, and while it may prove correct as regards Quebec and Ontario, it is certainly not correct as regards the North-West, as is proved by the well at Langevin Station, on the C. P. R. 247 feet above the sea, where the gas has been poring out with great force from a depth of 1151 feet, for more than four years. However, I for one, and doubtless many others of your readers would be interested in learning what reasons Mr. Beardsley can give for the opinion he expresses and, why he thinks the Trenton and other formations of central Ontario, which underlie the Niagara formation there, as they do in the Ohio Gas regions, should not prove equally productive of natural gas or petroleum.

I am, dear Sir, yours truly,
ALFRED R. C. SELWYN,
Director Geol. Survey of Canada.

The Utility of Waste Sawdust.

Ottawa, 19th Nov., 1888.

The Editor

SIR,—The recent investigation into the sawdust nuisance was referred to in a late issue of your journal, and now the evidence at Deseronto before the Ontario Mineral Commission proves that this fuel can be economically made useful at a profit to the lumbermen. The point that interests the large majority of your readers is the economic and useful application of the large and valuable fuel supply of the several Provinces of the country now wasted both in the woods in cutting timber and logs, making roads &c., and in the manufacture of the logs at the sawmills into lumber. This waste is equal to about one-half of the yearly produce of the saw-logs and timber from the forests annually produced in the various lumber districts, and is equivalent to many hundred thousand tons of coal. Now are the mine owners mindful of their interests in allowing this natural and yearly produced fuel supply to go on unused? Now that protection by tariff on imported iron has been adopted by the Government it behooves

the owners of our mines of iron and other ores requiring roasting or smelting to come to a clear understanding of this waste of a fuel supply admirably adapted for their purpose and cause measures to be taken to have it utilized for the joint benefit of the timber makers, saw mill owners, and themselves, and indirectly the whole community. An authority says:—"Either the mill owners must burn the refuse or remove their mills."! They do not require to move their mills or destroy this fuel. In Ottawa two of the mills would be expensive to alter but the others would not cost so much, and it will pay well for all of them to have the necessary changes made. The mill waste *can* be utilized, not *destroyed* either by fire or water, and the mill owners will reap the benefits of a wise trade economy as is done in several instances by other lumbermen.

The destructive burning of sawdust to get rid of it is a system of waste contrary to the conservation of energy or fuel wherever it is practised, and the Government, aided by the lumbermen and mine owners, should take an interest in having the "burning nuisance" stopped, and made a means of wealth in place of loss as at present. There has been at least twenty years of demonstration in the utilization of sawdust in the roasting of iron ore and reheating iron in Europe. Saw mill waste has been used with economy and success in the manufacture of iron in the United States. Charcoal has been used for smelting iron ore in Canada since 1735, and the St. Maurice furnace at Three Rivers "*is the oldest active furnace on the American continent.*"

If more demonstration is required that too can be furnished. The view taken of this subject seems to incline more to the evil that has been done (a fact which is only too apparent on many of our largest rivers in each province), while the good that can be accomplished with the economic use of it as a fuel is not considered, or is treated as a secondary consideration, when it is the all important ore. Let each district having ores to calcine, roast, or smelt, send a petition to their member of Parliament to have the wasted fuel supply of their district both in the woods in cutting timber and logs, making roads &c., and at the sawmills, made available for their use and let it begin at Ottawa.

I am etc.

ENGINEER.

The Copper Syndicate.—English papers state that a new contract has been entered into between the Copper Syndicate and the copper producers which is to take effect at the expiration of the agreement now in existence, that is, at the end of three years from the time that it was entered upon. The terms of the new contract are :—"According to the arrangements at present in force, the syndicate takes the production of the mines at a minimum of £62 10s. per ton in the case of the Rio Tinto; of £64 for the Calumet and Hecla; of £65 for the Mason and Barry, and of £70 for the Tharsis and the Cape Copper Companies. Further the syndicate pays the cost of storage, assurance, etc., and after receiving £5 per ton on account of its services, shares all excess profits with the companies. According to the new combination, the syndicate binds itself to take all the copper produced by all the companies, at a uniform price of about £72 10s per ton. It further abandons its claim for £5 per ton in excess of the minimum price, and shares equally with the companies in the profits remaining after all expenses have been paid."

PHOSPHATE.

In General.

The quantity of phosphate exported from the Ottawa Valley to the United States for the quarter ending 30th September last, was 700 tons, of a value of $7,080.35. This quantity, which was all ground, was shipped to Buffalo and Chicago.

The chief competitor with Canadian phosphate of late has been the Somme phosphate. It is now stated that these deposits are limited in extent and will soon be exhausted. Mr John D. Frossard has lately returned from France, and states that he has been commissioned by one of the largest fertilizer manufacturers there to report on Canadian phosphate mines with a view to the consideration of their future source of supply.

Du Lievre.

Dr. Francis Wyatt, a prominent analytical chemist, and associate editor of the *Engineering and Mining Journal* of New York, has lately paid a visit to the mines in this district. He states that an increasing interest on the part of American capitalists is being taken in our phosphate industry, and a considerable development may be looked for from that quarter, in the near future. Dr. Wyatt, we understand, will make a report on the industry to wealthy capitalists seeking investment, and from all we can learn, his statement will be most favourable to the district.

A portable engine pump has lately been added to the plant at the Little Rapids mines. A small staff is kept on development work.

The locks at this point are again under construction. "Ante-Humbug" writes to the Ottawa *Free Press* protesting against the excessive delay in carrying out this work, to the detriment of the important mining operations being conducted on the river, and draws attention to several instance of flagrant carelessness and inefficiency as exemplified in the present condition of the works. During our visits to this section we have heard many bitter complaints from the miners on this subject. A great deal of annoying delay in forwarding shipments has been directly caused by the alteration of the channel through the careless construction of one of the piers, and by stones from the excavation having been projected into the only navigable channel. It is nearly two years since this comparatively small work was first commenced, and surely it is high time that some more vigorous and energetic action was taken. Mr. W. J. Poupore, one of the contractors, has since written a very lame explanation of the delay, but in view of the recent developments of the Frazer case, his letter partakes very largely of the nature of a farce.

Mr. E. D. Ingall, Mining Geologist to the Geological Survey has recently returned from the field of his labours in the Du Lievre phosphate region. We understand that notwithstanding the unfavourable weather experienced, the investigation he has had in hand, namely, the study of the nature of the phosphate deposits and their associations with the enclosing rocks, has been well advanced. At least another season's field work however will be required before sufficient evidence will have been accumulated upon which to base conclusions, which will be of any use to the community interested, and which shall advance our knowledge of these matters beyond the point at which previous investigators in the district have left it. In this work he is being assisted by Mr. Jas. White, who is doing the necessary topographical work for the construction of a large scale map, upon which the results obtained may be shewn.

The High Rock Mine is producing large quantities of high quality ore from pit number eleven. Lately, special preparation was made for a large blast and shots were fired in 10 holes simultaneously by the electric battery. 100 tons of phosphate were blown out and the show still looked as well as ever.

The Phosphate of Lime Co.'s steamer "High Rock" has met with a serious accident which will unfit her for further work on the river this year. It is fortunate that the casualty occurred so late in the season. We understand the whole damage is fully covered by insurance.

The Canadian Phosphate Company is doing well both at the old Star Hill Mine and the new Ruby Mine, which is being fitted up with suitable appliances for effective work under the new manager Mr. J. Lainson Wills, an English mining engineer of good education and large experience. He has been connected with phosphate production for several years both in the Island of Aruba in the West Indies, and also in France. It is encouraging to have men of this stamp engaging in the Canadian phosphate industry, for although its peculiarities make experience the first essential for its successful prosecution there is doubtless great advantage to be derived from scientific knowledge. Many mistakes and much wasteful efforts have been occasioned by the too common contempt for "theory" which is characteristic of practical miners. A union of both knowledge and experience makes the successful miner, always allowing of course for the prime essential in underground explorations—luck!

A German miner, named Robert Lange, had his right leg badly crushed by a fall of rock at the Canadian Company's mines. Although the limb is severely injured, the doctors hope that amputation will not be necessary. He is receiving every care at the Protestant Hospital, Ottawa.

The Dominion Company are meeting with great success at the North Star Mine. Work has been discontinued for a time on the deep pit in order to test other portions of the property, and the new workings are proving exceedingly rich. According to various reports, from 600 to 1,000 tons are being produced monthly. Owing to the low water in the Lievres River and the non-completion of the canal, which seems doomed to be delayed for still another year, the Company was unable to ship all of its output this season and is now forwarding to Montreal 1500 tons of fine ore to be stored there during the winter, so as to be ready to take advantage of the cheap freights that usually offer at the opening of navigation.

The Emerald Mine is pursuing work which will further increase the output of this remarkable property, which has up to the present been the most productive acreage in Canada.

The Central Lake Mine continues to be advantageously developed by the veteran phosphate miner Mr. Peter Powers, under the direction of its owner Mr. S. P. Franchot. Over a dozen pits have been opened on good bodies of phosphate, and a tunnel is now being driven to strike a number of veins that appear on the surface of a hill.

The Anglo Canadian Phosphate Co has had some prospecting done on the High Falls Mines, which adjoin the Central Lake property and additional shows have been found besides the many that have already been opened. On one of their properties in Wakefield a show has been found by the noted prospectors, the brothers Tenpenny, who are so confident of its extent that they have made a contract to work it and will at once erect buildings and open roads.

An immense bed of quartz exists on this property which was declared by Mr. H. S. Vennor to be auriferous and recent examination confirms this opinion. Capt. Adams has lately visited the place and taken a variety of samples and we shall be able to report the result in our next issue.

Templeton District.

Dr. Mahon Hutchinson and Mr. Kasson, representing Chicago capitalists, have lately been examining phosphate lands in this district with a view to purchase. They also visited the mines in the Lievres district and were very favourably impressed with the large industry at present being carried on there.

Mr. C. B. Falardeau, of the Canada Industrial Company, is in negotiation with Chicago capitalists relative to the sale of his mines.

The cutting for the new inclined tramway at the Blackburn mines is nearing completion. This work has opened up several new veins which are yielding paying quantities of the mineral.

Perth District.

At the Otty Lake and Bobb's Lake Mines, the Anglo Canadian Co. continue to have good success with their contract work. At Bobb's Lake especially the deposits are turning out numerous and easily worked, so that an output of 10 to 12 tons per month, per man, is being steadily maintained. Last month an average force of 15 men all told, put out 158 tons. The men are clearing $2.50 per day for themselves.

Kingston District.

We note that the Ontario Mining Commission, who, by the way, are collecting much valuable information and doing excellent work throughout the province, have had their attention directed to several valuable properties at present being worked in this district, and among them the mines owned and operated by Capt. Boyd Smith at Eagle Lake, near Tamworth. Here one shaft has been sunk to a depth of 140 feet. The width of the vein, or rather the pay streak, opens out to 12 or 15 feet and then pinches to almost nothing. The phosphate obtained is red and green. The average of the shipments is about 84 per cent. This location was originally taken up for iron, and about 600 tons of the finest magnetic ore have been taken out, but the formation does not appear to favour the existence of iron to any large extent, and the greater part that has been raised has been taken out in mining for phosphate. From the Eagle Lake property Capt. Smith has shipped 3,200 tons, the principal part going to the United States. Capt. Smith considers the American market the most promising for Ontario phosphate. As compared with England and Germany, there is a considerable advantage in the matter of freight, while the price is about the same in Philadelphia as in England. As regards duty, all fertilizers are admitted free to the United States. All this looks well for the future of the Canadian phosphate interest, whose present proportions and future possibilities are but imperfectly known. There can, however, be no doubt about it that, properly worked, there is lots of money in it.

Mr. Wadley, who has secured an option on Mr. J. W. Trousdale's property near Sydenham, will sink a 75 foot shaft as a test.

At the Foxton pits, Sydenham, about 300 tons of high grade phosphates are ready for the ice. The shaft is now down 125 feet, showing a vein from 12 to 15 feet wide and drifts S.W. by N.E. of main shaft are opened. A steam hoist has recently been added to the plant. Additional accommodation has been provided for the miners, and a store house and magazine have also been erected.

Drifting has been carried on at Mr. Hibbards' tunnel at Ell Lake for a distance of 75 feet.

Messrs. Spalding & Kirwin's tunnel is being worked day and night. The proposed length of this tunnel is 640 feet, of which 80 feet is already driven.

The American Consul at Kingston informs us that 314 tons of phosphate have been shipped from this district to United States points for the present year.

MINING NOTES.

We shall be greatly obliged to mine owners and superintendents for such authentic reports of their operations as may concern shareholders and the public.

Newfoundland.

Copper mining in the north is going forward with much spirit and energy, the price of copper being high. At Tilt Cove mine it is expected that a thousand men will be employed this winter. Smelting works are in course of erection. At Little Bay copper mine 500 miners are at work, and 1,100 men employed. In other localities it is expected that new mines will be opened next year. As mentioned in a recent letter an important discovery of magnetic iron ore has been made at St. George's Bay, in proximity to the coal beds of that region, which are still unwrought. A sample of the ore has been sent to New York, and on analysis proves it to be of the best quality. The attention of mining capitalists has been attracted to it and a first-class mining expert has been sent to examine and report on the deposit. He arrived by last steamer from New York, and is now on his way to St. George's Bay. Should his report be favorable, abundant capital will be forthcoming to work this mine, and as coal is at hand, there can be no doubt that it will be utilized. There is thus the prospect of extensive iron works springing up here. Our correspondent is assured on high authority that the quantity of this splendid ore is immense. Already a second deposit has been found in the same locality and a grant secured. A well informed gentleman who examined the ore here, and has much skill in that line, states that there was nothing equal to it, or even like it, found in the Dominion. The very finest steel is manufactured from this ore. The presence of coal at hand adds greatly to the importance of the discovery. A half-breed who had known the secret for years, but kept it to himself rigidly, was at length induced to tell what he knew to his employer and to conduct him to the spot. It is said that an iron fever is setting in in Bay St. George.

Nova Scotia.

With the exception of the "Drummond," which only worked three days last week, the various collieries throughout the province continue to work full time, and a very fair output of coal is being maintained. Orders are not coming to hand with so much regularity, but most of the collieries are at present well supplied.

The operations carried on at Five Islands by American Capitalists under the direction of Mr. Wilkinson, have not yet resulted in any valuable discovery, but the indications appear very encouraging and prospecting is being vigorously carried on. No. 1 drift has been driven 90 feet, and in that distance cuts three seams of coal of first class quality. These seams are small but experienced men have no doubt but that to the dip workable seams will be found. Drift No. 2 was only driven a short distance before a fourth seam was found; this was somewhat larger than the others and coal taken from it has been tested and is very highly spoken of. No. 3 Drift has been commenced, and at last reports was in some 70 feet in dark fire clay. The company seems inclined to spare no expense in order to prove the value of their extensive property.

At the Intercolonial Company's mines work is dull, but it is thought that the winter's operations will be better than predicted. No effort will be spared by the management to bring about such a desirable state of affairs.

At the Black Diamond colliery about one hundred tons a day are being shipped. It is gratifying to know that the owners are meeting with deserved success in the opening up of an abandoned property. They are at present drifting from near the bottom of the present pit to prove a new seam which is said to extend into their property.

At the Acadia mine (the property of the Acadia Coal Co., limited) work is going ahead briskly, and the management are turning out all the coal they can.

At the Albion mine (owned by the same company) work is not so good, and at the north and south sides of the Macgregor pit the men are only working every other day, and three quarter time at that. Coking coal is furnished from this pit to the Londonderry iron mines. At the Ford pit the management expect to have the big pumps going by the end of next week, when the unwatering of this pit will be continued, and it is hoped without intermission. At the English slope the sinking is going down fast, and the

coal is said to improve to the deep, the depth at this point is 800 feet. A new Dominion safety boiler and other machinery has been erected at the third seam. It is expected that the seam will be ready for a large output by the beginning of the year.

At the Vale colliery the new lift has been sunk 600 feet and levels broken off, coal if anything a little higher, and of excellent quality for steam and furnace use. The output from the McBean slope last month was some 150 tons per day.

At Springhill the miners are experiencing dull times; only one slope is working, owing to two of their slopes being "drowned out." More constant work will be had when the water is out of the slopes.

It is claimed that a valuable seam of coal has been discovered at Brookdale, twenty-three miles west of Spring Hill, but owing to the faulty nature of the ground and the very wet season, little can be said about it as yet.

At the Joggins, work is steady and about 150 tons of coal is shipped per day, mostly railway and local land sales.

There is considerable excitement in iron and copper just now on the Grant Area, East River. Capt. McVicar has 14 men at work mining and shipping the ore to Eureka Station, and from there by rail to Londonderry. The ore is pronounced by the Londonderry people to be of very superior quality, and it is a wonder no one takes more interest in these valuable iron properties.

In the Guysboro Specular mines some work has been done and the veins traced for a long distance. The ore carries 73% of metallic iron and of the very best quality and free from acids. No doubt work will be resumed in the spring on an extensive scale.

At the gold mines work is fairly brisk Edgerton is doing about as usual and turning out 100 oz per month for about fifteen men's labour.

Dr. McMillen and others have been prospecting their property on a large scale at Sheet Harbour, near the Board Camp diggings and have uncovered four valuable veins all showing gold. They have 72 areas, and as this property is on the Salmon River belt, great things are expected from it.

It was thought at one time that this season's shipping at Cow Bay would not reach or exceed that of last year, but it has turned out otherwise. Up till date the shipments are considerably in excess of those to the same time last year. The miners too have made a better average pay than last year. The "Ashdene" has left with her fourteenth cargo. She will make one more trip. This vessel carries a cargo of 1500 tons, and when her last cargo for the season is shipped she will have carried the large quantity of 22,500 tons. The "Glendale" will overtake fourteen trips, carrying 1,400 tons on each occasion.

The shipments at the Reserve mines are also in excess of those for the same period last year.

The shipments from Caledonia Mines for the nine months ending Sept. 30th, reached the high figure of 87,000 tons, several thousand tons in excess of shipments for same period of last year. An average shipment of 22,000 tons per month, for four months, is a remarkable good one. A considerable quantity more of coal is expected to be shipped previous to the close of navigation. During the coming winter the levels will be extended, and it is also the present intention to sink the deeps.

Mr. J. H. Coldwell, of the Minneapolis Mining Company, has purchased of Amos and Busby Fisk and Richard Hunt, the property known as the Fisk leads, on the Molega barrens for $9,000.

The Rabbit lead on the property of the Molega Mining Company is supplying good quantities of 2½ oz. ore to the crusher. This is a fine lead that appears more promising with every blast.

New discoveries of gold are reported from North Brookfield and West Caledonia.

As a result of 17 days crushing 207 ounces of gold were milled from 43 tons of quartz at the Withrow mine, South Uniacke.

The Dufferin Mining Company returns 267 ounces from 600 tons of quartz crushed as its yield for the month of October.

The yield at the Touquoy property, Moore River, for last month was 54½ ounces of gold from 380 tons of quartz crushed.

The Oxford mine returns for October are 144½ ounces from 149 tons crushed.

The Whiteburn Company report for the same period 213½ ounces from 80 tons quartz.

The following are the official returns so far received at the Mines Office for the month of October.

District.	Mill.	Tons Crushed.	Ozs. Gold.
Sherbrooke,	Miners,	200	54
"	Goldenville,	40	5
Darrs Hill,	Dufferin Mg. Co.,	650	267
Cariboo,	Touquoy,	380	54½
"	Montreal Co.,	302	49
"	Caffrey Mill,	8	10
Uniacke,	Withrow,	46	217½
Lake Catcha,	Oxford,	149	144½
Whiteburn,	Whiteburn Co.,	80	113½
Fifteen Mile Stream,	Egerton G.M. Co.,	170	74
Stormont,	Rockland,	396	386
Renfrew,	Free Claims,	40	25¾

The unusually wet weather of the past spring, summer, and autumn months, has interfered greatly with the labors of gold miners. Mines usually almost dry have been flooded with surface water, while in others the pumps which before were of sufficient capacity to keep the water down, have had to be replaced with more powerful ones. This has caused delay, and it speaks well for the richness of the mines that, in spite of these great drawbacks, the yield of gold has been so large. If returns continue to come in to the Mines Office as large in proportion for the balance of the year, the prospects are that the total yield for 1888 will exceed that of the past year.—*Critic.*

New Brunswick.

The Markhamville Manganese Mines and mills are in active operation, upwards of forty hands are employed in and about the mines. Major Markham has just returned from the west, he attended a meeting of "The American Institute of Mining Engineers" at Buffalo. He also sold considerable high class ore to various manufacturers in the western and eastern cities. He is now shipping 260 tons of blast-furnace ore by schooner from St. John to Philadelphia.

Capt. Alley has a few men still working at the Glebe Manganese Mine in Waterford, the captain certainly deserves credit for his courage in sticking to this property in spite of many discouraging elements.

The N. V. Gold and Silver Mining Co. have a No. 5 Blake pump with boiler and steam and water pipes at Sussex station, on the way to their mine at Philamaroo. This pumping plant is supplied by McAvity & Sons, St. John, the proprietors of the famous Boiler-Feeder which is rapidly displacing all other kinds, in this neighbourhood.

A gentleman from Boston has during the summer been operating in a small way the several times-abandoned manganese mines on Quacco head, in St. John County, but our correspondent believes no shipments of ore have yet been made.

The Baltimore people who bonded or bought the Stockton manganese mine have not yet taken possession; neither is the Equity suit which Mr. Gould instituted against the property settled. Hence nothing is being done at the mine this year.

The Freeze copper mine, in Albert County, is still at rest. The parties having the property bonded appear to have failed in effecting a sale in London. This is to be regretted, inasmuch as the mine is said to be a valuable one, and the owners, having expended a large amount of money already, are unable to continue the operations.

Quebec.

Notwithstanding the unfavourable weather a large quantity of asbestos has been taken out this season, but although the output shows a marked increase over former years, the supply of the mineral has not been equal to the demand particularly for the first and second qualities, and many manufacturers have been obliged to use "seconds" entirely. The prices have also gone up and we are informed that firsts are now selling at $95, while seconds realize from $50 to $60.

Another correspondent writes: "The long continued wet weather this season has seriously affected the working of the Asbestos mines and the output is considerably under what it would have been with a fine dry season. There has been a good demand for the output all of which has been placed at advanced prices. This fact has caused considerable excitement in the district and some new properties have been opened up, but only a limited quantity of surface asbestos has been produced from these. The asbestos business is increasing steadily, but there is as yet, no fabulous consumption of the mineral as some people in the district imagine and the supply, so far, has been about equal to the demand, this season's restricted output being the means of our getting advanced prices.

The output from the Anglo-Canadian Asbestos Company's mines will be about 200 tons to date, this season. Operations have been confined to sinking and doing some further exploratory work, and the management have uncovered some

of the largest and best veins ever discovered on this property, one of these from bottom of pit measuring over 7 inches in width. This system of working required only a limited staff of hands, hence the smaller output.

The Bell Asbestos Company will take out 1200 tons. Air compressors, steam, drills and the latest labour saving appliances are now in use at their quarters, and it is estimated that their profits on the present season's work will figure close upon $50,000.

The Johnson Company have also done remarkably well, the shareholders clearing a large amount on the season's operations.

King Bros who make a specialty of cobbing and cleaning their ore to perfection, and in this way obtaining the very best prices, have sold their entire output and must also clear many thousand dollars. Their mines are in splendid working condition at present and reflect great credit on the manager, Mr W. King, M E

On account of the low lying location of their property, the Ross Ward Co. have suffered much by the wet weather, which has greatly retarded their operations and consequently greatly reduced the output from what it must have been under more favourable conditions. They have, however, done fairly well.

Some twenty men are employed at the plumbago property on the Lievre. It is expected that the mills will be working by next June.

The Villeneuve Mica and Mining Company of Buckingham has closed down their mines at High Rock for the winter. Mr. Von Rehm, the manager, leaves shortly for Europe.

We have received some fine samples of ore from the Lawn Silver Mine, owned by Messrs. J. & C. Russell, Renfrew. Two shafts are being sunk on the property, and the ore increases in quality as depth is attained.

The surface openings on the property of H. A. Church, in the Township of Cawood, show a number of large crystals of excellent quality of mica, and give good encouragement for further development.

Messrs. J. & C. Russell, Renfrew, have taken out 200 tons of iron ore from their Bristol mine.

Mr. Louis Wertheim, the largest asbestos manufacturer of Frankfort, Germany, accompanied by his son, Mr. Ed. Wertheim, has been visiting several asbestos properties in the province with a view to purchase. We are informed that he has taken over Dr. Reid's property in Coleraine, consisting of 100 acres, paying in cash $10,000. He is also negotiating for a further purchase of 340 acres [illegible]ge A of Coleraine. Captain W. L. D Learmonth has been left in charge of the property An extensive working plant, consisting of steam drills, air compressors, 100 horse power engine, derricks, &c., is being purchased, and every effort is being made to work the property on a large scale. Operations have begun and will be continued during the winter. Mr. Wertheim is greatly pleased with the appearance of our asbestos mines, and speaks very highly of the quality of the mineral, which he has been importing largely for some time.

Ontario.

It is reported that a rich find of gold has been made on the location owned by Mr. Isaac Moore, Ottawa, about 2½ miles from Straight Lake Station, on the line of the C. P. R. Mr. A. C. Lawson, of the Geological Survey, has just returned from that district, and has brought with him a number of samples, which are being assayed by Dr. Hoffman.

"The Wahnapitae Mining Company," with a capital stock of $30,000, divided into $1,000 shares, has been incorporated under the Ontario Joint Stock Act. The promoters are A. M. Dodge, the big New York lumberman; James Scott, Toronto; G. F. Marter, M P P., and J. W. Hartman, of the same place. The company will carry on general mining business in the district of Nipissing.

It is expected that the main vein of the Connolly mica pit near Sydenham will be tapped in a few days.

A commodious boarding house is being erected at Smith & Lacey's Ell Lake mica mines. Some fine mica is at present being taken out. During the winter new steam pumps and hoisting machinery will be put in, together with several new buildings. The same firm has recently opened a white mica property near Caladar. The vein has been traced by surface outcroppings for a distance of one and a half miles.

Port Arthur District.

The Badger mine, which all along has produced large quantities of "bonanza" ore, has again struck it rich at the bottom of the shaft The extremely rich streak has now widened out to eight inches The wonderful development of this mine is attracting great attention. It is an instance of the best goods being done up in small parcels—the vein being much narrower than any of the other working mines. Dr. Brent, from Alaska, is now testing the output at this mine. His return to this region gives much satisfaction.

The Beaver and Elgin mines continue developing in a satisfactory manner, and the "Shuniah Wreath" is occasionally striking bunches of rich ore, which give promise of eventual great results. Its neighbour to the west, the Silver Mountain "West End," is giving more than satisfaction to its fortunate owners.

The other silver mines are keeping hard at work, but have nothing special to note.

A public meeting has been called for the 19th December at Port Arthur to discuss railway matters and promote the construction of the first fifty or sixty miles through the silver region.

Mining men are impatient to learn the decision of the Privy Council of England with reference to the disputed ownership of mineral and timber in the Rainy River region. A decision was expected on the 18th inst.

Prospecting for both silver, gold and iron still continues brisk, no snow having fallen as yet to interrupt explorations.

The promised geological chart of this region from the Geological Survey office is eagerly looked for.

British Columbia.

The fire in the No. 2 level of the Southfield mine, Nanaimo, after causing a delay of nearly a week, is now considered extinguished. The work of replacing the fan, engine and house at the air-shaft is well under way, and it is confidently expected by the management that the Southfield mine will soon be again in full blast.

During the month of October seven cargoes of iron ore, amounting to 1,995 tons have been taken from Texada Island to Port Townsend, where it is being manufactured into pig-iron for shipment to San Francisco. The duty on this ore was $1,496.25.

The Oyster Harbor Coal Mining Co. are about to continue their explorations for coal with a new and powerful Diamond drill which is now on the way from Chicago.

Mr. Samuel M. Robins, superintendent of the Vancouver Coal Company, has commenced the construction of new loading wharves in front of Cameron Island, and which will connect with the present wharves of the company. The new wharves will have a frontage of over 300 feet and will thus increase the loading facilities of the company fully 100 per cent. The increased output of coal from the company's several mines has made the necessity for greater loading facilities. The new wharves will be fitted up with the most modern appliances in the shape of shutes, etc, to ensure the quick dispatch of vessels.

An examination for managers' certificates, under the Coal Miners' Regulation Act, 1877, will be held at Nanaimo, on 1st December next.

Enough is known of Porcupine creek, which is 18 miles from Donald to prove it good placer ground. It is easily accessible from the railroad; the bed-rock in places is not deep; the dirt gives returns almost from the grass roots, and there is plenty of water. Every man who has returned from the camp reports the discovery claim as unquestionably rich—good for $20 a day to the man at least. If that be true there are other claims likely to be just as good. At present some thirty claims have been staked off and recorded. Lumber is being whipsawed for sluice boxes, and the actual work of opening up claims is already under way.

At Tunnel mountain, three miles from Field work is being pushed in preparing the ground for working the mine successfully, and ore has been shipped to Vancouver. A tramway to conduct the mine with the railroad track is under way, the ore cars and other material being expected daily. John Barr, of Anthracite, has the contract for building bridges over the Kicking Horse between the mine and Field. The company have a large ore body in sight, and as soon as they begin shipping in earnest, the outside world will awaken to the fact that there is at least one producing mine in the Kootenay district.

This district is close to the Columbia river and four miles down stream from Jubilee mountain. W. J. Irving has several locations on the butte. On one of them, the Silver King, the ledge crops out to a width of over twenty feet. He has struck the foot wall but not the hanging wall. From an assay made July 12, at St. Paul, Mr. Irwin got a return of $22.40 in silver, a trace of gold and 2½ per cent in copper to the

ton. The ore is easily worked, and if concentrated will undoubtedly pay largely. Mr. Irving would like to dispose of an interest in these claims, the money received to be expended in development work.

Reports are coming in of rich and extensive discoveries recently made in the mountains back of Windermere and on Toby creek. The ore carries a large percentage of copper, and from $28 to $93 in silver to the ton. The ranchmen of that section are all out on the mountains, either prospecting or doing assessment work.

The Petroleum Fields of Ontario.

ROBERT BELL, B. A., S.C., M. D., L.L.D.*

The recent discoveries of natural gas and petroleum, by boring artesian wells in northwestern Ohio and in western Pennsylvania, have given a new importance to the study of certain geological questions in connection with these products. In addition to the comfort and convenience arising from a cheap and abundant supply of natural gas for domestic purposes, the economy in power which it affords for manufacturers gives such an advantage to the towns fortunate enough to possess it that others cannot compete with them; and thus population and wealth are drawn to the sources of natural gas. A comparison of the Ohio gas and oil region with the petroleum field of Ontario, will, therefore, be interesting at the present time, in order that we may the better understand and generalize on what has been accomplished up to the present time, and be in a position to reap the benefits of the experience both of our neighbours and ourselves. The writer has endeavoured, in the following pages, to bring together and compare some facts and observations which may throw additional light on the subject. The present paper will also contain the latest statistics and other information in regard to the present condition of the petroleum industry of Ontario, including the methods employed in the production and refining of the oil. For the information of those not familiar with the history of the subject, it will be necessary first to notice very briefly, the discovery of petroleum in Ontario, and the progress of its economic development. More than forty years ago, the occurrence of petroleum in Western Canada and in the Gaspé Peninsula, was described in the early reports of the Geological Survey of the provinces and specimens of the oil, still in its Museum, were collected in both these regions by the late Sir William Logan. Although at that time no use for the substance was known in Canada, except as a supposed remedy for rheumatism and for spavin in horses, Sir William, with characteristic sagacity, foresaw that it might some day become of use in this country, as it had long ago proved to be in the east. About the beginning of 1860, following the introduction into the province of illuminating oils distilled from coal and shale, and when attention was recalled to the existence of natural oil and "gum-beds" in the County of Lambton, in the west, and in Gaspé in the east, some gentlemen visited our provincial geologist at Montreal for the purpose of obtaining information on the subject. Before entering on a discussion of the matter, Sir William took them to the show-case containing bottles of the dark fluid from both of the above regions and said, "Gentlemen, I have been waiting for you for the last twenty years," and then proceeded to give them the benefit of his knowledge of a matter with which he was, even then, quite familiar, but which was new to almost every one else in this country.

The petroleum field of Ontario may be described, in a general way, as situated near the south-western extremity of the province, and on rocks of Devonian age, overlaid by a considerable thickness of drift. The "gum-beds" above referred to, are situated on the level and wet clayey land in the southern part of the Township of Enniskillen, and in the northern range of Dawn adjoining; and in 1860 some oil was obtained by digging wells in the clay at this locality—one of them sunk by James M. Williams, of Hamilton, reaching the rock.

On February 19th, 1861, W. James Shaw astonished the country by striking "rock-oil" in an artesian well which he sank in the shales and limestones beneath the drift clay at this place, to which the name of "oil springs" was now given, and which soon became a large village. It was here that the great flowing wells were struck in the winter of 1860-61. The oil then escaped so rapidly that many thousands of barrels were lost before it could be controlled by the means provided for saving it. When the writer visited the locality in the spring of 1862, the trunks of the trees over a considerable extent of low ground, were blackened to a height of several feet by the oil which had temporarily flooded the neighborhood. The drift clay is here from seventy to eighty-five feet in thickness, and is followed by 170 to 185 feet of soft bluish drab shale or marl, the "soapstone" of the drillers. This is succeeded by a corniferous limestone, into which the wells were sunk only about ten feet, or to a total depth of 260 feet from the surface, where the best flow of oil was obtained. In 1886-87, many pumping wells were producing oil at a depth of about 100 feet below this level.

Soon after this discovery of petroleum in the underlying solid rock at Oil Springs, wells were sunk a little to the north of the centre of Enniskillen, where surface indications of oil had been observed. A considerable number of them proved to be flowing wells, and they afforded large quantities of petroleum for several months, but one by one they were all at length reduced to pumping wells, and as the number of borings increased, the average yield of each diminished, or the wells gave out altogether. Since that time, however, the total quantity of oil produced each year has been kept up or increased by constantly sinking larger numbers of new wells, the process of well-boring and pumping having been greatly simplified and cheapened.

The corniferous limestone, having been supposed to be the oil bearing stratum in Enniskillen, and the same formation being found to contain petroleum in its cavities in various parts of south-western Ontario, boring for oil in these rocks was soon commenced at random in numerous localities underlaid by this formation before the distribution or mode of occurrence of the fluid was known to be governed by any law. These efforts resulted in finding petroleum in small quantities in widely separated places, as well as in the more productive amounts which were discovered at Bothwell, twenty-three miles south-east of Petrolia; in Oxford, east of London; and near Tilsonburg in Dereham, in the country between London and Long Point. The general want of ultimate success of these enterprises, except in Enniskillen, and the low price of oil, soon confined operations to that township. By degrees the area of the petroleum field came to be pretty accurately defined. Before this had been accomplished all sorts of theories had been indulged in as to the course which the supposed "oil-bearing belt" should take, and later as to the form and extent of the productive territory. Meantime, the mode of occurrence of petroleum and its relations to geological structure were being investigated elsewhere.

The anticlinal theory in connection with the accumulation of gas and petroleum was first mentioned to the writer by the late Sir W. E. Logan in the autumn of 1860. He was then in the habit of comparing the filling of a soda-water bottle with gas and water to the process which he believed went on under the impervious strata of an anticlinal. But this idea seems to have originated with his colleague, Dr. T. Sterry Hunt, who mentioned it in a lecture delivered in Montreal and published in the *Gazette* of that city on March 1st, 1861. According to this hypothesis, gas and oil, following hydrostatic laws, accumulate at the highest points, or the domes, along anticlinal folds. All the transverse joints and fissures, and the spaces or channels between beds in deep-seated, unaltered, sedimentary rocks, are believed to be filled with water. The particles of gas and oil, as they are generated or become liberated in bituminiferous rocks, naturally tend to rise through these waters unaided, perhaps, by earth-tremors and earthquake jars and shocks, such as are common in Canada and the northern United States. Downward projections and irregularities in the forms of the water spaces would arrest the gas and oil till these receptacles became filled to overflowing. Ultimately the lighter fluids from all points, following upward the slopes of the strata, would accumulate in largest quantities under the summit of the dome. The gas would take the highest place, the oil the next, while the water would be forced downward to an extent which would counterbalance the elastic force of the gas and the weight of the accumulated petroleum. The compressed gas would force back the oil and water alike from all the upper spaces. If the crown of such an anticlinal dome were tapped by a bore-hole from above, the gas would of course escape first, followed by the oil, and then by the water. This is what actually takes place in productive oil regions, and experience in Canada, the United States, Galicia, Baku, Burma, etc., has shown that the accumulations of petroleum are connected with anticlinals in the manner just described. The more extensive the anticlinal, as to either breadth or depth, the greater are the quantities of gas and oil which become collected, as the result of what may be called the larger drainage area. Profitable supplies of petroleum and gas are, therefore, not to be looked for on anticlinals of small extent. We know, from analysis of average samples, the approximate amount of oil which hydrocarbons in a given weight or bulk of rock, are capable of yielding by artificial means, but even the most moderate of these calculations show a proportion of oil and gas, far in excess of that which has ever been taken from the richest areas in productive fields; and it must be remembered, too, that most of this has, no doubt, been originally derived from other areas at greater or less distances from those actually drawn upon.

It is evident, therefore, that only a small proportion of the hydrocarbons actually present in petroleum-bearing strata ever become converted into the liquid or gaseous form by natural processes. As already stated, experience has proved the correctness of the anticlinal theory in regard to petroleum and gas; and this fact has become useful, not only to point out probable localities for their occurrence, but also to indicate large areas in which, from the attitude of the beds, it would be useless to look for them, although they may be constantly forming in the strata, the unfavorable indications for their ac-

cumulation being altogether due to geological structure. An essential condition for the retention of the petroleum in the situations which have been described, is that the reservoir must be covered by an impervious stratum, such as a considerable thickness of shales, clays or marls to hold them down. When this is not the case, or where the anticlinal fold has b en too sharp and has become fissured, vast quantities of gas and oil have in many instances escaped to the surface, or have saturated the higher porous strata, as, for example, the remarkable and very extensive Petroleum-bearing sand beds of the Athabaska district, in the North-West Territories of Canada. Another necessary feature for a productive oil-field is a sufficient body of porous or fissured and channelled rock for storing the accumulated oil This may be the oil-pro ducing formation itself, or it may be a non-productive rock lying above the source of the oil or below the impervious cap. Sometimes, leading fissures or joints and spaces between beds communicate with a vast number of other fissures or channels, and when one of these, or a branch closely connected with it, happens to be struck by a bore-hole, a great reservoir of the pent up oil may be freely let out. In the commoner case of small fissures, it is now customary in Enniskillen, when the proper depth has been bored, to explode a torpedo in the bottom of the hole, in order to open new channels for the oil, before attempting to pump at all. The conditions necessary for a produc ive oil-field, are, therefore: (1.) An anticlinal or a dome-like structure on a large scale, in unaltered sedimentary strata. (2) Deeply seated petroleum—forming rocks of considerable volume. (3) A stratum of porous, fissured or channeled rock, which may be either coincident with or above the oil-producing beds, sufficiently thick to store the petroleum (4) An impervious layer of argillaceous rock to prevent its escape.

It is not to be supposed that petroleum may be found at all points along anticlinals over oil producing strata, even where the conditions are favorable for sealing it down. In addition to the main anticlinal line, there must be a secondary upheaval, so as to produce a dome or an elevation, at the crown of which the oil may gather and rest. The process by which petroleum is thus concentrated may be compared to a reversal of the drainage of streams of water into a central basin or pond, the attitude of the petroleum basin being inverted, owing to the difference in the specific gravities of the fluids. On the map of a country, therefore, the forms of oil-producing areas are found not to follow long lines, but to occur in insolated areas, or to be "spotty," as this mode of distribution is called by the well drillers. The oil wells at present worked in the township of Enniskillen belong to two distinct areas of permanently productive territory. That of Oil Springs is of small extent, and lies between the village of the same name and the south line of the township. The once celebrated "Hendricks Spouting-well" is just across this boundary line in the township of Dawn, but it is a little outside of the area which has proved to be continuously productive for twenty seven years. The oil field of Petrolia begins a little to the south east of the centre of Enniskillen, and extends in a west-north-westerly course, taking in the north-east corner of Moore, nearly to the centre of Sarnia township, a distance of twelve to thirteen miles, with a breadth of between two and three miles. The central belt of this area, one mile or less in width, is the most productive. A third oil-bearing area has lately been found a little to the north west of the centre of the township of Euphemia. The first well in this "territory" was put down about July 1st, 1886, and up to November 1st of that year, nearly twenty wells had been sunk, but only four were in operation at the latter date, when about 1,000 barrels of oil had been produced. The petroleum is here found at a depth of 255 feet from the surface, in what is called the "upper show," which will be again referred to. The Euphemia and Oil Springs areas lie in a straight line, running west north-west, or parallel to the longer axis of the Petrolia area, but the general bearing of all these together would be north-west and south-east, or in the direction of the Bothwell area already alluded to.

(To be continued.)

Foreign Mining Laws.

Arthur Strauss.

(Continued from October issue.)

Frequent reference has been made in this paper to the State mining authorities, and it is essential to know how these authorities or mine courts are constituted. They consist of the Board of Trade, the mining courts, and the mine inspectors.

There is an inspector for each mining district, whose duty is more particularly to see that the laws of public safety, and other matters, are properly carried out. The inspectors are under the supervision of the Mining Courts, the Courts themselves, however, examine and grant all concessions. Appeal is allowed from the inspector's decision to the Courts, and in some cases from the Courts to the Board of Trade. No relations of the inspectors are allowed to hold shares in mines. The inspectors have to watch over the safety of all buildings and shafts, etc., as well as the preservation of life and health of the miners, etc. Should the inspector apprehend any danger, the Mining Courts send a warning to the committee of the mine, but should the danger be pressing, the inspector, has power to order immediate action for the prevention of accidents; if not obeyed, the inspector may carry out the necessary work himself, and charge the mine with the cost. In case of accident or death, the inspector has to be immediately informed of it. The inspector then orders immediate measures of relief, and steps to prevent further injury, and the mine as well as all surrounding mines, have to assist him in every way. The inspector has further to see that the mine is worked according to the plans, and his expenses are paid by the mine. Heavy fines are imposed if any of the rules and regulations are infringed.

If I have transgressed too much on your patience by giving all these technical details, my excuse must be that I consider the laws relating to mines and minerals of unusual importance, but especially to those in this country who are more immediately affected by them—to the prince as a large landed proprietor, and possessor of extensive mineral rights; to the landowner, who may be called upon at any moment to establish his right, resist obtrusion, abide by the acts of his agents, or to give compensation for injuries done by them or his workmen; to the adventurer, who expends his capital in exploring the hidden treasure of the soil; to the merchant, whose dealings must be conducted in accordance with the peculiar laws and customs which prevail in particular districts; and to the labourer and artisan, who, on the one hand, are subjected to civil and criminal proceedings for acts of omission as well as commission, wilfully incurred in the course of their employment, and, on the other, have a remedy for grievances or injuries to which they may be subjected by oppression, negligence, or commands of their employers. From those, indeed, who have neither time nor capacity to enlarge their views beyond the contracted sphere in which they are appointed to move, a superficial acquaintance with the laws under which they labour is all that can be expected, but for those on whom greater obligations or duties are imposed, a knowledge of the law as it exists in all foreign countries is, in my humble opinion, indispensable.

Mr. John Tonkin: Are dues paid abroad on net or gross amount?

Mr. Strauss: On net.

Mr. W. Rowe: That means on profits?

Mr. Strauss: Yes, after costs are deducted.

That is generally the case all over the continent.

Captain Charles Craze related his experience of mining in Germany. There the Government inspectors met the managers of a Government district and arranged dues. For instance, in 1875 and 1876 lead was £12 a ton. The Government authorities met the managers of the district, and, instead of fixing £12 a ton, fixed £10 as a basis of calculation. They also allowed 7½ groschens (or 15s.) per ton for dressing, so that dues were really paid on £9. 5s., when £12 was being received for the ores. The dues paid were two per cent. on £9. 5s.

Mr. James Wickett: That is not on profits?

Captain Craze: No, it is on all ores raised, that is on gross receipts.

Mr. Strauss said the Government gave the miners the option, either to pay 2 per cent. or to agree to fix upon a certain stated sum

Captain Josiah Thomas: Is the percentage never above 2 per cent.?

Captain Craze: No never.

Mr. H. P. Vivian: Do the Government inspectors ever interfere with the working of the mines?

Mr. Strauss: No—or very little. The managers, knowing how strict the laws are, usually conform to them. There is very little clashing. Captain Craze said when he went to Germany he found the shaft in the mine was sunk twelve fathoms perpendicularly. At the 14 they struck the lode, which had an underlie north of three feet in one fathom. They sunk on the course of the lode. When the inspector visited the mine he objected to this. Captain Craze understood the matter was optional. The inspector wanted the shaft to be sunk down-right. The inspector fetched two other gentlemen from Bonn, and they said, "How will you fix your skip-roads and your pump lifts if you do not sink down-right," and he (Captain Craze) explained to them how they overcame that difficulty in Cornwall, and the result was, the inspector did not compel them to sink a down-right shaft, and they continued on the underlie, but the inspector could, and did, compel them to fill up all old workings with stuff sent down from the surface.

Mr. Strauss said much that Captain Craze had referred to was alluded to in his paper. For instance, he had said, "In case of any change in the mode of working, notice must be sent to the authorities."

* Read before the Royal Society of Canada.

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 mentionod 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.

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.

SEALED TENDERS addressed to the undersigned, and endorsed "Tender for McGregor's Creek," will be received at this office until Friday, the 23rd November next, for the construction of pile protection work at McGregor's Creek, town of Chatham, Kent County, Ontario, in accordance with a plan and specification to be seen at the Department of Public Works, Ottawa, and on application to Mr. A. McDonnel, C.E., P.L.S., Chatham.

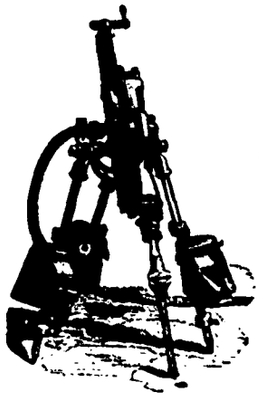
Tenders will not be considered unless made on the form supplied and signed with the actual signatures of tenderers.

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, 29th October, 1888



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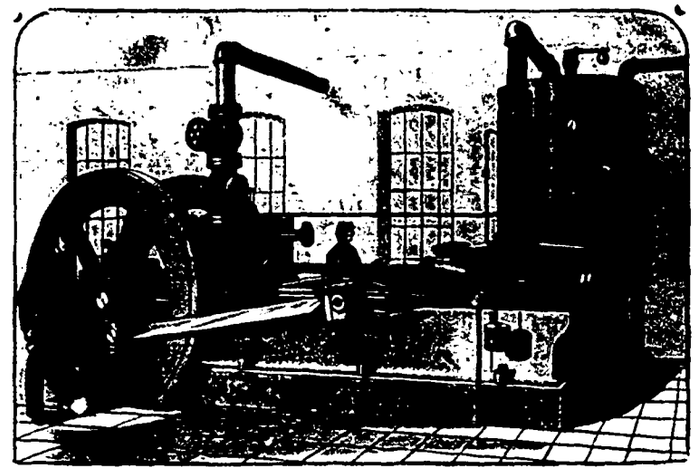

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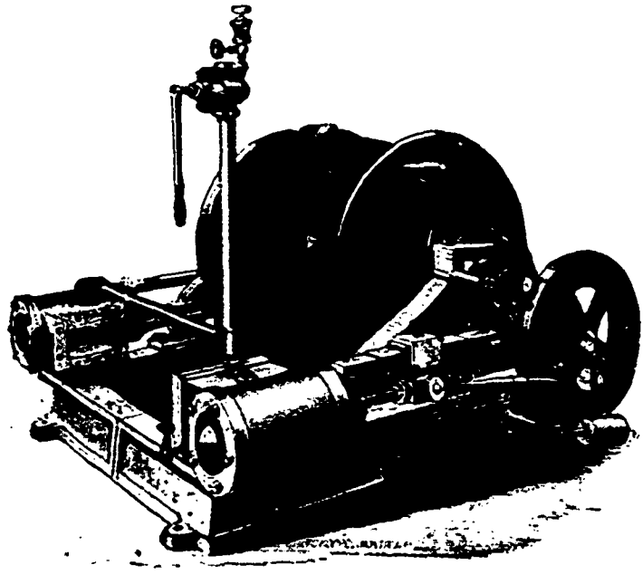

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Mining Regulations

TO GOVERN THE DISPOSAL OF

Mineral Lands other than Coal Lands, 1886.

THESE REGULATIONS shall be applicable to all Dominion Lands containing gold, silver, 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 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 it 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 fradulently, 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 by 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.