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The Canadian Mining Review

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An Absurdity of the Tariff.

During the last session of Parliament there was an effort made by several members representing mining constituencies to have the oppressive and prohibitory duties on mining machinery removed. As the result of this effort the following section appeared in the new Tariff List, bearing date of March 28, 1890: "Free mining machinery imported within three years after the passing of this Act, which is, at the time of its importation, of a class or kind not manufactured in Canada."

The appearance of this section gave great satisfaction to the majority of the mining interests, and to the gold miners in particular, who have had to pay the heavy burden of 30 per cent. upon almost all the machinery used by them in mining and milling, and to whose product, from its nature, the N. P. did not and could not afford protection.

Several importations under this Act have come under our personal knowledge, some have been allowed free entry, others had to pay duty, and of this latter class we propose to speak briefly. The language of the section being so clear, and also so comprehensive, it was not supposed that any difficulty could be encountered in its administration.

But in the following case it would seem that the department, or its officers, chose to put their own interpretation upon the words, "mining machinery." Several importations, at divers times since the 28th of March, were made of silvered copper plates which are a part and parcel of the amalgamating machinery of every modern gold mill. These plates are used to catch the fine gold coming from the stamps, and are made of soft rolled copper, subsequently annealed and coated or plated with a thin layer of metallic silver upon one side. They are not used in any other business, or for any other purpose. Entry was sought to be made under this Act, and by the Local Collector was referred to Ottawa, where the ruling was made by the then Acting Assistant Commissioner of Customs that such plates "are not mining machinery, such as was contemplated by this Act."

The absurdity of this reply and its illogical character is briefly shown.

First, as to the fact of its being of a "class or kind not manufactured in Canada." There are no copper works in the Dominion to-day which do or can make the plain copper plates and anneal them. Further there is not an electroplating establishment in the Dominion which has a bath large enough to take in and properly plate these coppers with silver; hence even were the coppers available, the manufactured amalga-

mating plates could not be produced, at present, by any concern in Canada. It is, therefore, evident that these plates are of a "class or kind" which not only *is* not, but which *can* not at the present time be made here.

Now as to the point that these amalgamating plates are not "mining machinery." A gold mine is of little or no value without a mill, and no gold mine that we know of ever *was* a mine until it had a mill. No gold mill is equipped to save the fine gold unless it has these amalgamated plates, which are a necessary and integral part of the machinery and plant. They are just as essential to the proper and economical working of a gold mine as the engine which hoists, or the air drill which bores the rock, or the pump which keeps the mine clear of water, or the stamps which crush the rock. Being, therefore, of such importance that they are "mining machinery" would appear to us to be axiomatic.

In the discussion in the Commons on the 26th of March, on the matter of admitting machinery free of duty, the interpretation of the words "mining machinery" was not directly alluded to, but incidentally was fully expounded from the context. As examples we may quote Mr. Mara, who, when speaking of Kootenay, said: "Here we have hundreds of tons of ore on the dumps that, in treating, would give employment to a great number of men," obviously this treatment referred to is metallurgical. He says further when speaking of British Columbia: "We say that such machinery as concentrating machinery, quartz mills, reduction mills, etc., are not manufactured here. * * * We ask that the Government will take the duty off that class of machinery for a short time." Mr. Dawson said: "There are certain things such as diamond drills and *amalgamators* which are not produced in this country."

Mr. Charlton, who was a member of the Ontario Mining Commission, in speaking of his experience on that Commission, said: "It was found that various kinds of machinery were not produced in Canada, such as for *amalgamating* work, stamps, diamond drills, etc."

We would, therefore, like to ask Mr. Assistant Commissioner of Customs what mining machinery *was* "contemplated by this Act."

The gold miner usually has a hard enough time to make his mine pay, and if he, in the future, shall have to spend time to find out what "was contemplated" by the Tariff when it says one thing and means another, he will pray for the deacease of the Tariff or the "contemplator" or both.

Florida Phosphates.

Dr. Francis Wyatt, of New York, who has recently returned from a professional visit to Florida fully bears out our forecast of Florida as a competitor in the phosphate market. Here are his concluding remarks:—"To take up such short options as are now offered on lots

of land in various counties at great distances from each other, under any conditions of price or surface indications, is simply suicidal, since they allow no time for efficient inspection. The country is wild and practically unsettled. Traveling in the interior is attended by the greatest difficulties and inconveniences. There are no wagon roads suitable for transportation purposes, for the horses sink everywhere knee-deep in sand. The railroad facilities, broadly speaking, are nearly nil, and the postal and telegraphic services are utterly inadequate. Under these circumstances (and I am rather understating than overstating facts), the control of a widely disseminated lot of workings carried on simultaneously would be impossible.

As to the question of quality and usefulness of these phosphates, I consider that the large number of my analyses of samples taken in all directions and under all kinds of conditions gives a satisfactory answer. It has been said that these phosphates are, to a great extent, combinations of phosphoric acid with alumina and iron, but I have shown that in the great majority of cases this is really a misapprehension. On the whole, their average richness is less than we were led to expect, and the proportion of really high grades is extremely small. While I can see no present outlet of importance for the second-class matter, the rich boulder material compares favorably with many others much appreciated by manufacturers of superphosphate. If they are properly selected before shipment, I can, therefore, foresee no possible objection to the high grades, and I believe they will find a ready market at European ports directly their composition is fully understood."

Dr. Wyatt thinks the field may prove profitable to those who purchase and work mines with judgment: but intending purchasers are warned of the disastrous results that will follow to those who are led away by the prevailing "boom" and pay exaggerated prices for surface indications or anything but high grade test.

Arbitration.

The losses sustained through the deplorable strikes at the Springhill and Wellington collieries, not only to the employers and employes, but also to the consuming public, is fitting illustration of the necessity of arbitration as a simple and suitable method by which these and all other demoralizing disputes may be smoothed over and adjudicated. For many years boards of arbitration have coped with the great conflicts between capital and labor in Europe, Great Britain and the United States, and having proved successful in these countries it cannot be doubted that in instances like the present they would be of immense service to both parties in effecting a satisfactory solution of the questions at issue. The benefits that these boards have conferred upon the coal and other trades are incalculable. A most friendly feeling has taken the place of hostility, and confidence and mutual respect

now exists where formerly all was suspicion and hatred. The changed relations of employer and employed have been recognized; they have met at the same table as equals; and out of this has grown a condition of affairs that will make it impossible for the old conditions to return. Mr. A. J. Mundella, M.P., who has been so largely instrumental in the initiation of this wise institution in England, gives many striking instances of the successful operation of permanent arbitration boards in that country. He says: "If the workman of any branch conceive that they have grievances to complain of, in addition to the ordinary representatives of that branch a delegate may attend and lay the case before it. The first business at our meetings is to receive delegations. They retire after having made their statements, and the board proceeds to deliberate. We have never met without settling at least half a dozen questions, some important and some trivial, which, if allowed to remain open, would produce irritation. * * * A large part of the credit of the success of this board, and this change in the relations of classes, is due to the provision for regular meetings of the board. The great curse of industry, and the fruitful cause of difficulty, is a foolish obstinacy and a false pride. This arises in many cases from a want of knowledge and a lack of common courtesy in matters concerning both capital and labor, and in which both have an equal interest. This quarterly coming face to face, this meeting as equals,—and in all questions that come before this board they are equals, and it is foolish to ignore this fact,—and this discussing of subjects of common interest as sensible men seeking for the facts and inclined to moderation and concession if need be, have had a marvellous effect in removing this pride and obstinacy, and bringing about that respect and courtesy that must be the basis of all friendly negotiations between capital and labor." In France there is the "Conseils des Prud'hommes," probably the oldest system of arbitration in existence, and which provides a simple and effective method of adjudicating all labor troubles and disputes. They are composed of an equal number of masters and workmen, each trade electing its own representatives, with a president and vice president named by the government. Arbitration is compulsory upon the application of either, and the decisions of the court can be enforced the same as any other court of law. Fully 95 per cent. of the cases brought before these boards have been amicably settled. In the States of Massachusetts and New York, and elsewhere in the United States, arbitration has speedily and unostentatiously decided many cases, which, if allowed to proceed, would have developed into serious strikes and lock-outs. Trade disputes, such as those at Springhill and at Wellington, are, happily, of rare occurrence; but as our country develops, and our mineral and other important industries expand, the possibilities of more frequent friction are apparent. So im-

pressed was the Royal Commission appointed by our own Government to enquire into the relation of capital and labor, that in their Report, published last year, the necessity of a permanent, as well as local boards in industrial centres, was strongly emphasized. During the last session of the Legislature of Nova Scotia provision was also made, under the Mining Act, whereby labor disputes should be submitted to a board to consist of two arbitrators appointed by the workmen, two representing the company, the four thus chosen to select a fifth, or umpire. This was an excellent and wise provision. But at Springhill it appears that the company refused to submit to arbitration, apparently determined to starve the men into their unreasonable demands. The result has been eight weeks of a most distressful strike, which has not only crippled the operations of the company and been keenly felt by the men, but has also seriously affected trade, both in the vicinity of the mines and in the upper provinces. Strikes are neither rational nor civilized, and, as in these cases, invariably involve loss and hardship. The vital interests of master and miner must necessarily depend on unity, and only by the harmonious action of both can great material progress be attained. Let both meet each other fairly in a spirit of full acknowledgment of each other's rights and duties; when differences occur let them be submitted to a competent board of arbitrators; and when one or other fail to agree on this course, as at Springhill, and at Wellington, let the government step in and make immediate arbitration compulsory.

Suicidal Strikes.

Mr. Powderly, the prominent leader in the labor disputes across the border, is reported to have said, at a Pennsylvania meeting on the 14th June last, "But we are not in favor of strikes. We think they are suicidal. I will say that I have never known of a strike which has been won by the men where the evil consequences have not overbalanced the benefits." The miners at Springhill and at Wellington will bear witness to the truth of his statement.

Cement in Ontario.

The value of the export of cement from Britain to the United States and Canada, for the first half-years of 1888, '89 and '90, stands as follows:—

	1888.	1889.	1890.
To United States...	\$1,094,126	\$941,075	\$1,190,375
To Canada.....	64,000	78,107	108,538

Our neighbors claim they are making cement equal to the English article, but their importations show no decline. The maximum duty is 40 cents, which should not be prohibitory of the Canadian article if we had a first-class one to offer. And why not? We should be well able to make first-class hydraulic cement in Ontario.

Steam Pumps.

Hints on their Selection and Practical Management.

(From the Safety Valve.)

In the first place, regarding the selection of a steam pump, with so many excellent pumping machines in the market, this is a difficult subject to discuss and one that we cannot go into without doing somebody an injustice. It must therefore suffice if we direct attention to a few cardinal points that every steam pump to be entitled to choice should possess. Simplicity of construction is materially an advantage, but like everything else, it may be overdone. In itself it can hardly be regarded as forming a reliable basis for selection, although the simplest pump that conforms to all other requirements, such as efficiency, durability, reliability, &c., is undoubtedly the best. At the same time, the very nature of the work a steam pump is ordinarily called upon to perform, demands that its parts shall be readily accessible for inspection, and neither so costly nor so intricate as to be difficult of replacement in case of wear or breakage. A pump that is made on the interchangeable plan as to its parts, has many advantages in this respect. This applies particularly to the water valves, which are liable to become obstructed by foreign bodies in the water or where the pump is employed for moving thick or gritty fluids.

Select a pump if possible in which the valve motion is reliable at any speed—in other words, a steam pump that can be run at the extreme limit of slowness or at its highest capacity without fear of the steam valves failing or becoming deranged. Pumps have been placed on the market that are liable to slacken off and stop if run "dead-slow," or to run away if left to operate at high speed, and such unreliability, especially where boiler feeding or circulating service is demanded, is likely to prove dangerous. A pump that has "dead centers," is for like reasons undesirable and it is moreover a frequent source of trouble where it is necessary to "start up" in a hurry. A reliable steam pump, such as the best makers supply, will run steadily and constantly at a speed proportionate to the steam supplied and will start promptly from any part of the stroke as nearly as possible at full pressure. The pump valves should have an area of about one-fourth the area of the pump.

Never buy or install a pump that you suspect to be too small for its duty; one or two sizes too large will do no harm, but half a size too small will make an immense amount of trouble. It is easy to determine the capacity of a pump by multiplying the area of the piston in inches by its stroke in inches which will furnish its full capacity per stroke in cubic inches, and divided by 231, in gallons. An allowance of at least twenty per cent., and in some instances more, must be made in these calculations for the leakage caused during the rise and fall of valves, inaccuracies in fitting, &c., as well as the "clearance" between the valves and the piston or plunger. If it is a question of forcing water to a certain height, multiply the amount of water in gallons to be raised per minute, by the weight of one gallon (835 pounds) and the product by the height in feet of the discharge from the point of suction. The result, divided by 33,000, will give the theoretical horse power required to accomplish the work, but a liberal allowance, never less than ten per cent. and in some cases as high as thirty per cent., must be made for friction in pipes and bends, for leakage in pipes, leakage and friction in pump, &c. The speed at which a pump should be run must also be taken into consideration—a boiler feed pump, for instance, should not be run at a higher speed than about forty double strokes per minute. Where water has to be pumped through a long and particularly a vertical line of pipe, a slow movement is more economical and will furnish the best results. A small pump, working rapidly, is subject to greatly increased wear and tear under such conditions, especially where no check valve is provided to relieve the pressure on its valves. The velocity of water in pump passages should not exceed 500 feet per minute.

For condensing engines, the feed pump should have a pump plunger equal in diameter to one-eleventh the diameter of the steam cylinder when the pump stroke is one-half the engine stroke and one-eighth the diameter of the steam cylinder when the pump stroke is one-quarter the stroke of the engine. The capacity of a pump for boiler feeding should never be less than one cubic foot of water per hour to each horse power. It must be considered also that water expands when heated, and where hot water is used in feeding, the capacity of the pump should be increased so that it equals the equivalent in cold water.

In setting up a steam pump run all lines of pipes as direct as possible, every bend increases the friction to be overcome. Short bends and short angles should be avoided wherever possible; they retard the flow of water and increase the work of the pump. Where turns or bends must be made, have them as easy as possible. Pipes should be as large as the pump connections at least, and where very long or very crooked, larger sizes must be used. The discharge pipe should never be re-

duced in capacity between the pump and the discharge, especially in feeding boilers. Where pipes are branched to divide the discharge it must be remembered that the area of a pipe primarily governs its capacity; two 1-inch pipes discharge about the same amount of water as one pipe 1½ inches in diameter. The length of a pipe must also be taken into consideration. A pipe two inches in diameter and 100 feet long will only deliver one-fourth as much water as a pipe of the same diameter and only two inches in length.

The suction pipe especially should be made as direct as possible and, above all things, should be perfectly tight. A very small leak in it will greatly impair the efficiency of the best pump. A large one will positively neutralize its action. In locating a pump with regard to suction, it must be remembered that the ordinary suction pump will hardly lift water at sea level more than thirty feet with the most perfect vacuum ordinarily obtainable. It is unwise to depend on a pump doing as much as this, differences in elevation, etc., being considered, and from twenty to twenty-five feet should be the limit to which a pump should ordinarily be taxed. Where water is to be raised to a greater height than this, a force pump, or combined force and suction pump, should be employed. Very hot water cannot be handled by a suction pump, the reduction of atmospheric pressure prior to the lift causing its transformation into steam and vapor. The placing of an air chamber in the suction pipe, by keeping a large body of water near the plunger, makes the supply steadier. It should be made long in the neck, so that when the water is passing through the pump barrel it may not be forced up into the chamber. This would result in an absorption of the air in the chamber and a consequent reduction of the supply of water. Every pump drawing its supply from tanks, wells, rivers, ponds, etc., should have the end of the suction pump covered by a strainer.

The exhaust pipe of a steam pump should be made to run downward when convenient. This will enable the water of condensation to flow out in place of requiring to be driven out by the exhaust.

Finally, the pipes of all pumps located in exposed situations should be provided with unions, so that on extremely cold nights the pump may be detached to prevent freezing. For the same reason the drip cocks of both steam and water cylinder should be left open whenever the temperature is likely to fall below freezing while the pump is standing idle.

Steam pumps, like all other machines, require careful attention to insure their efficiency and durability. It is necessary to see that they are well lubricated and well wiped at regular times and at frequent intervals, especially in the case of boiler feeding or circulating pumps, they should be looked at to make sure that they are not only running, but doing their work. The check valve furnishes one indication of their satisfactory operation. If it rises and falls regularly with each stroke of the pump and its vibrations are communicated to the feed pipe below the valve, the pump is working. It is as well to shut off the stop cock between the check valve and the boiler in a feed pump now and again, and, taking out the check, allow the pump to make a few strokes, which will remove any sediment or foreign substance from the seat. If, although the pump may be running, the water in the tank or boiler does not show its effects, some defect may be looked for. A leak in the suction pipe, worn or loose packing, water or check valves obstructed by some foreign particles, water supply shut off, or, in the case of a well fed by springs, fallen below the point of suction, or pipes choked with such mineral sediments as lime, salt, and other water deposits are among the commonest causes, and can be remedied by any engineer. In the case of a boiler feed pump located near the boiler it is likely to become heated and may, in such a case, fail to lift. The pet cock in the pump barrel may be opened and the accumulated hot water run out, after which it will usually be found that the pump will resume work.

The above points include such as may be regarded as of general importance. There are others that will occur to our readers from time to time, especially where pumps are employed as in breweries, oil refineries, distilleries, chemical works, etc., for moving thick or volatile fluids, or such as are likely to exercise a destructively corrosive effect on metals or packing substances.

A Strikers' Paradise.—Strikers seem to have a paradise in New South Wales. At Sydney the dock laborers threatened to suspend operations unless they were allowed a certain period of the day to smoke their pipes or cigars. Rather than precipitate a conflict with their men on so trivial a matter, the masters have allowed them three-quarters of an hour per day for indulgence in tobacco, and have agreed to pay them for it, too. The next step in concession will be to supply these hard-worked operatives with a particularly fine brand of tobacco and highly ornamented Dutch pipes. But it must be said in favour of this agreement that men work with freshened energy when they have occasional intervals of rest or idling.

A New Canadian Enterprise.

The Dominion Iron and Steel Company has been incorporated at St. John, New Brunswick, with a capital stock of \$500,000. The company is formed for the purpose of erecting and operating mills for the manufacture of rolled and hammered iron, bar iron, cut nails and spikes, horseshoes, railroad and other spikes, fish plates, polished shafting and other articles. The plant is to be built in the vicinity of the city of St. John, on the Bay of Fundy, accessible by vessels and adjacent to lines of railway that connect with all the points east and west. The building will contain four train rolls, ten furnaces, nail and spike factory with 50 machines, a horseshoe machine, with a general machine shop and shafting department. The mills will be built, equipped and operated in the most modern and approved manner, and will strive to equal the output of similar concerns in the United States. The capacity of this plant per month is to be 240 tons cut nails and spikes, 760 tons scrap iron bar and 40 tons horse-shoes, besides shafting and other articles of manufacture. The men who are at the head of this enterprise point to the fact that 40,000 tons of rolled and hammered iron were imported into the Dominion of Canada from Great Britain in 1887. They further recite the fact that while scrap iron enters the Dominion at a tariff duty of \$2 per ton, the duty on nails is 1 cent per pound, and that on scrap bar iron, etc., is \$13 per ton.

This plant will be fed with Nova Scotia and New Brunswick coals, and by being located on the Bay of Fundy it hopes to escape the high freights now paid by the Western Iron Works, which plant is compelled to carry also a stock of coal sufficient for the winter months. The water location selected will admit of weekly supplies being received the year through. They say they will be able to put the finished product of their plant in Montreal, Toronto, and other western towns of the Dominion at the same rate per ton as it costs the iron plants there to freight their coal. The erection and equipment of this plant will cost \$200,000. The company will use scrap iron imported from foreign countries until Canadian pig can be produced cheaply enough to compete with the cost of scrap.

This company makes the following comparison with the prices in the United States markets to show the prospects for good profits:—Cut nails in the Canadian market are worth, at wholesale, \$2.60 per keg of 100 pounds for two-penny and upwards; other sizes in proportion, while in the Boston market they are selling at \$2.05, a difference of 55 cents per keg of 100 pounds, equal to \$11 per ton.

Colliery Ventilation.

In a recent paper read before the summer meeting of the Institute of Mechanical Engineers Mr. E. Bainbridge said:—

"The elements of danger, waste and inconvenience in furnace ventilation for mines have caused an almost general adoption of mechanical ventilators; and many endeavours have been made to improve the ventilating fans which were in existence twenty years ago.

Fans.—The considerations to be aimed at in selecting a mechanical ventilator are as follows:—First cost of fan, engine and foundation; future cost of maintenance; economy of fuel and stores; useful effect of fan. Several committees of mining engineers have been formed to report upon the relative merits of various machines; and as at the present time a series of exhaustive experiments is being made by a committee of the Northern Institute of Engineers, it may be sufficient if in this paper the writer simply refers to some of the chief types of ventilating fans in operation in this country, at the same time giving particulars of a case in which each separate fan is now adopted. These fans are the Guibal fan, Walker's improved Guibal fan, Cockson's, Schiele's, Capell's, Waddell's and Lupton's fans.

The Guibal fan is that most largely adopted, and is so well known that it needs no description. In Walker's improved Guibal fan the chief variation in the style is the same results with a small diameter of fans and the air, instead of being admitted, as in the Guibal fan, on one side only, is admitted on both sides. The Guibal movable shutter is replaced by an anti-vibrating shutter, which is very effective in its action. The tendency recently has been to adopt fast-running fans, which, however, are most suitable where limited qualities of air are required. Four years ago the writer adopted this principle at the Woodthorpe Colliery, near Sheffield, by applying an 8 foot Cockson fan, driven direct without gear by one of Williams and Robinson's direct acting engines, which runs very quietly at a speed of 280 revolutions per minute. At this speed the fan gives about 58,000 cubic feet of air per minute, with 3 inches of water-gauge. The engine since it was started has run about 500 million revolutions, and has cost a very small amount for repairs. The actual economy in the useful effect of a fan depends upon the cost of fuel; but bearing in mind that the useful effect is found to vary from about

15 per cent. to 70 per cent., the matter is of importance; and in the ordinary carrying on of a colliery the quantity of fuel used in driving a fan engine, which practically never stops working, may be said to be one-fourth of the entire fuel used. A simple contrivance in connection with ventilating machines, which the writer is adopting at the Nunnery Colliery, may here be mentioned. A new engine-house which is now being completed will be ventilated by taking a pipe from the roof and passing it into the fan chamber; the air leaving the house will pass up through two ventilators placed in the roof, and thence to the fan.

Steel Production in Great Britain in 1888 and 1889.

In 1888 Great Britain made 979,083 tons of Bessemer steel, a decrease of 42,764 tons from the product of 1887. In 1889 the production was 943,048 tons, a decrease of 36,035 tons from that of 1888, and the total decreased manufacture in both 1888 and 1889, amounted to 78,799 tons. Bessemer steel rails, in both years, nearly made up 50 per cent. of the total output. In 1888 the aggregate production of Bessemer steel rails was 979,083 tons, in 1889, 943,048 tons. As far back as 1882 the maximum output of these rails exceeded that of 1889 by 292,737 tons. Other descriptions of Bessemer steel production in the five principal districts of Great Britain in 1889 amounted to 1,665,122 tons. The average production of steel per converter in 1888 was 23,003 tons, in 1889 it was 25,156 tons. In 1889 the number of converters in operation was 60¾ acid and 22½ basic; total number in the kingdom at that time, 91 acid and 26 basic.

The total British production of basic steel in 1889 was 493,919 tons, or about 14 per cent. of the total output of Bessemer and open hearth steel of all kinds, which amounted together to 3,569,960 tons.

The aggregate output of basic steel in England, Germany, Luxemburg, Austria, France, Belgium and other countries in 1888 was 1,953,234 tons, of which 1,493,032 tons was under 17 per cent. of carbon; in 1889, 2,274,552 tons, on which 1,764,639 was under 17 per cent. of carbon.

Great Britain's production of open hearth steel in 1889 was 1,429,169 tons, an increase of 136,427 tons over that of the previous year, and 448,062 tons over that of 1887. The gain was principally made in the Cleveland district. The net increase (there was decrease in two districts) in 1889 was 136,427 tons. Of the total production of open hearth ingots throughout the kingdom in 1889, 1,357,461 tons were acid and 71,708 tons basic.

At the end of 1889 there were 274 acid and 17 basic open hearth furnaces existing in the kingdom, a total of 291, or three more than at the end of 1888.

Nickel and its Uses*.

Dr. E. D. Peters, Jr.

Common observation would suggest that the consumption of nickel for plating has increased markedly in late years, and as a fact it has more than doubled in the last decade, and even in the past two years has shown a further though moderate increase, which is true also of the German silver manufacture. But the effort is being made in Europe to extend the consumption of nickel in all possible directions. For example, by the introduction of rolled nickel plate as an advance over tin plate. Among the proposed uses none attract so much interest as the use of nickel in alloy with steel to increase the latter's strength. A French invention has effected means for preparing such alloys with regularity and even composition. Lately Mr. James Riley, of Glasgow, Scotland, has published a valuable contribution to the knowledge of the physical characteristics of various sorts of steel when alloyed with nickel which is here abstracted from "Engineering." In the first place, a visit to the place of manufacture in France demonstrated to his entire satisfaction the degree of certainty with which the desired products could be obtained from the crucible. A number of casts were made, the composition being varied at will and the quality and properties of the metal being indicated beforehand. Subsequently it was shown at English works that the composition of the metal can be as effectually controlled in the open-hearth furnace as in the crucible. Mr. Riley states that the alloys can be made in any good open-hearth furnace working at a fairly high temperature. The charge can be made in as short time as an ordinary "scrap" charge of steel—about seven hours. Working the steel requires no extraordinary care; in fact, not so much as is required in working many other kinds of charges, the composition of the resulting steel being easily and definitely controlled.

No special arrangements are required for casting, ordinary ladles and molds being sufficient. If the charge is being properly worked, nearly all the nickel will be found in the steel; almost none is lost in the slag—very different in this respect from charges of chrome steel.

The steel is steady in mold, it is less viscous than ordinary steel, it sets more rapidly and appears to be

thoroughly homogeneous. The ingots are clean and smooth in appearance on the outside, but those richest in nickel are a little more "piped" than ingots of ordinary mild steel. Any scrap produced in the subsequent operations of hammering, rolling, shearing, etc., can be remelted without loss of nickel in making another charge. No extraordinary care is required when reheating the ingots for hammering or rolling. They will stand quite as much heat as ingots having equal contents of carbon but no nickel, except perhaps in the case of steel containing over 25 per cent. nickel, when the heat should be kept a little lower and more care taken in forging. If the steel has been properly made and is of correct composition, it will hammer and roll well whether it contains little or much nickel; but it is possible to make it of such poor quality in other respects that it will crack badly in working, as is the case with ordinary steel. In obtaining a correct idea of the value or usefulness of alloys of nickel with iron or steel, it should be remembered that the composition is complicated by manganese, carbon, silicon, sulphur and phosphorus, whose influence must be carefully watched, requiring long series of experiments. In the absence of these extended series the following will still give valuable results:

In table 1, test No. 6, the carbon present (0.22) is low enough to enable us to make comparison with ordinary mild steel, which would give, when annealed, results about as follows: elastic limit, 16 tons; breaking strain, 30 tons; extension, 23 per cent. on 8 inches, and contraction of area 48 per cent. Therefore, in this case the addition of 4.7 per cent. of nickel has raised the elastic limit from

16 up to 28 tons, and the breaking strain from 30 up to 40 tons without impairing the elongation or contraction of area to any noticeable extent. In test No. 3 somewhat similar results were found with an addition of only 3 per cent. of nickel, combined with an increase of the carbon to 0.35 per cent. In tests No. 2 and 5 there is extreme hardness, due in part to the large quantity of carbon present, but also to the presence of nickel in addition. In test No. 9, with the carbon very much reduced, this characteristic hardness is intensified by the increase of nickel to 10 per cent. This quality of hardness obtains as the nickel is increased, until about 20 per cent. is reached, when a change takes place and successive additions of nickel tend to make the steel softer and more ductile, and even to neutralize the influence of carbon as is shown in the test No. 2, in which there is 25 per cent. nickel and 0.82 carbon. In this matter of hardness, due to increased additions of nickel, there is some resemblance to Hadfield's manganese steel, but valuable qualities of nickel steel are reached before machining becomes extremely difficult. There are experiments showing that by hardening and tempering it may be possible to increase largely the breaking strain and elastic limit of these alloys. The alloys polish well, the color being lighter as the proportion of nickel increases.

They do not corrode as easily as other steel, the 1 per cent. nickel steel welds fairly well, but this quality deteriorates with each addition of nickel. Considerable ultimate advantage may be expected from these alloys, particularly where the percentage of nickel is less than five.

The Evrard Coal Washer.

A coal washing apparatus known under the above name and which has attracted some attention abroad is described as below in the *Bulletin* of the Industrial Society of France:

"It consists of a rectangular sieve plate about 10 feet long and 3 1/2 feet wide fixed on a pyramidal hutch, having a plunger box attached to one of the long sides, and a continuous opening variable by adjustable slides for the discharge of the heavier waste on the other. The apertures in the sieve plate vary in size, the largest being nearest to the feed end. The piston, which is circular in form, and of very much smaller area than the sieve plate, is a wooden disc moved by an eccentric, and communicates motion to the water in the hutch by a cushion of air confined above the water in the piston box. The eccentric is adjustable upon its shaft so as to allow a certain variation in the length of stroke of the plunger. A clack in the disc allows air to enter if a vacuum is formed below it on the return stroke by reason of the whole of the water not being returned, as in the case of washing very fine slack containing clay, which always absorbs a notable quantity of water. The scraper frame, which is the essential novelty of the machine, is a harrow-like frame suspended by a system of jointed rods above the sieve plate, and receiving motion from a cam acting upon the counterpoised arm of an angle lever, which gives a slow forward and quick return motion. The frame, which is somewhat larger than the sieve plate, is connected at one end with the slide closing the feeding hopper, and receives a fresh portion of the material at the commencement of the stroke, which is dropped upon the plate at the coarse end, and subjected to the most energetic action of the water, while the finer portions of previous charges brought to the surface are drawn forward by the teeth projecting from the frame towards the discharging end. The length of stroke of the frame is 20 inches, so that the surface of the washed material is broken up six times in its passage through the 10-foot length of the machine. Usually the frame is suspended at such a height as to pass clear of the charge on the return stroke; but when the slack treated is very dusty, it is so adjusted that by acting on the muddy surface on the backward passage, the return of the water to the hutch may be facilitated. In the latter case care is taken to keep a depth of from 2 to 4 inches of water above the top of the charge to prevent the suspended mud from settling.

"The finely divided material accumulating as mud in the hutch is discharged at intervals through a pipe at the bottom into settling basins, and the clear water is pumped back to supply the machines. If the interior of the hutch is divided into two parts, each with a separate discharge pipe, the mud from the first is usually waste, while that from the second, being derived mainly from mixed coal and shale, is generally clean enough to be used for firing colliery boilers. When treating unclassified slack, containing all sizes up to about 2 inches, the washed material other than the fine surface coal is subjected to a final screening, giving clean coal in lumps from 2 inches to 6-10 inch; while all below the latter size is ordinary boiler slack with about 10 per cent. of ash. The fine coal raked off the top of the charge at each stroke, by the last teeth in the frame, which are deeper than the others, is received on an enclosed apron at the back of the sieve, where the bulk of the adherent water drains away, and is ultimately pushed over a shoot into a wagon placed to receive it. The stroke of the piston may be varied within considerable limits by adjusting the eccentric so as to be available for washing lumps of all sizes from 4-10 inch up to 2 inches in diameter. The number of strokes varies from forty-three per minute for stuff below 1 inch to fifty-five for larger sizes. The weight of these machines is about 6 tons each. They are arranged to work in pairs, each pair requiring a motive power of 4 to 6 horse-power, and one man to attend to them. The produce is from 12 to 18 tons per hour according to the amount of dust in the slack treated, or an average of 15 tons for two machines. They have been adopted, or are in course of erection, at six collieries in the north of France, and the basin of the Loire, four in Belgium, and three in Spain."

Lamp Cleaning by Machinery.—As a substitute for the slow and expensive process of lamp cleaning by hand, our attention has been directed to the safety lamp cleaning machine patented by Messrs. Ackroyd and Best, of Morley, near Leeds. It is claimed for this machine that it not only does many times the amount of work, in a given time, which can be done by hand, but also that it does the work better. The apparatus both draws and replaces the screws which fasten in the glass, and thoroughly cleanses the gauzes while the man or boy is cleaning the brasswork. With this machine, which is being used at some of the large collieries in the Durham, Yorks, South Wales and Wigan districts, it is stated that one man can clean over a thousand lamps a day, effecting a saving of from 35 to 40 per cent. over the old method of cleaning by hand.

TABLE NO. 1.—PHYSICAL TESTS of Steel alloyed with varying proportions of Nickel.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Composition:												
Nickel, per cent.	1.0	2.0	3.0	3.0	4.0	4.7	5.0	5.0	10.0	25.0	25.0	49.4
Carbon	.42	.90	.35	.60	.85	.22	.30	.50	.50	.27	.82	.35
Manganese	.58	.50	.57	.26	.50	.23	.30	.34	.50	.85	.52	.57
Tensile tests as cast:												
Elastic limit (tons)	a	b	19.8		b				c			
Breaking strain (tons)			34.9									
Extension per cent. in 4 inches			2.5									
Contraction of area per cent.			5.6									
Tensile tests as cast and annealed:												
Elastic limit (tons)	27.3		24.0									
Breaking strain (tons)	54.6		34.9									
Extension per cent. in 4 inches	1.5		2.5									
Contraction of area per cent.	9.5		9.0									
Tensile tests as rolled:												
Elastic limit (tons)	32.1		31.4	29.4		25.1	30.0	31.1		38.2	22.0	20.5
Breaking strain (tons)	57.6		51.5	51.5		40.5	46.4	52.0		51.4	47.6	37.4
Extension per cent. in 8 inches			9.0	9.0		17.75	10.0	14.0		10.5	43.5	
Contraction of area per cent.	11.0		20.3	10.1		23.4	12.5	15.6		11.7	47.6	12.0
Contraction of area per cent.	24.0		37.0	9.0		42.0	22.5	14.0			60.0	24.0
Tensile tests as rolled and annealed:												
Elastic limit (tons)	30.1		28.0	30.3		28.0	28.0	32.5		12.75	15.1	21.0
Breaking strain (tons)	55.1		48.5	42.9		40.6	42.6	46.8		45.8	42.1	37.0
Extension per cent. in 8 inches			7.5	7.5		20.0	15.0	13.5		29.0	40.0	
Contraction of area per cent.	18.7		20.3	9.		25.0	17.5	14.0		30.0	45.3	20.0
Contraction of area per cent.	45.0		42.0	12.0		44.8	18.5	17.0		28.6	43.6	29.0

a Test piece defective. b Too hard to machine with mushet steel; makes a fine tool, tempered a dull red in boiling water. c Too hard to machine; makes a good cutting tool when tempered in cold-air blast.

TABLE NO. 2.—TORSION TESTS of Steel alloyed with varying proportions of Nickel.

Sample number.	Number of twists in 3-inch length.	Diameter of bar one inch, lever one foot long.		Condition.	Composition.			Remarks.
		Elastic limit.	Breaking strain.		Nickel.	Carbon.	Manganese.	
1	1 7/8	857	1849	As hammered	1.0	0.42	0.58	No. 1 sample in No. 1 Table (unannealed).
2	2 1/8	677	1507	"	5.0	0.30	0.30	No. 7 " " "
3	1 3/4	665	1729	"	3.0	0.35	0.57	No. 3 " " "
4	1 7/8	621	1493	"	4.7	0.22	0.23	No. 6 " " "
5	2 3/8	553	1554	"	50.0	0.35		
6	3	510	1950	"	25.0	0.27	0.85	No. 10 " " "
1 A	1 7/8	697	1809	Annealed	1.0	0.42	0.58	No. 1 " " "
2 A	2 3/8	653	1485	"	5.0	0.30	0.30	No. 7 " " "
4 A	2 3/8	652	1443	"	4.7	0.22	0.23	No. 6 " " "
6 A	5	360	2100	"	25.0	0.27	0.85	No. 10 " " "
7	1 1/2	601	1689	"		0.51		47.2 tons per square inch (Siemen's steel).
8	1 7/8	601	1697	As hammered		0.51		50.4 " " "
9	3 1/8	445	1229	"				30.1 " " "



MINING NOTES.

Nova Scotia.

Pictou County.

(From Our Own Correspondent.)

A good deal of lively prospecting is being done on the East River iron areas, and results, so far, have been encouraging, work on the Cameron and McColl & Son's areas opening some very promising deposits of ore.

At all the collieries in this county mining operations are going ahead briskly. The Black Diamond Colliery is the only one that is a little slack.

The opening up of the Foord pit continues smoothly. The management has put in place a very nice little blow-down, which is giving every satisfaction. The fan-shaft is being sunk through the big coal, and when this is completed places will be driven down hill for air-ways. At present they are compelled to use the pump shaft for down-cast, and hoisting shaft for up-cast.

The shipments from the Drummond Colliery for the month of July amounted to 18,000 tons, which is the largest export ever made from this colliery. For the month of August the shipments should be fully 20,000 tons, as they have double-shifted their pillar work.

Mr. John Douglas, who is prospecting for the Black Diamond Company at a point north of the present workings, has nothing new to report this month. So far his work goes to show that what he has been unearthing is nothing other than the west crop of the overlying seams of the Albion Mines.

The large hoisting-engine at the Vale Colliery, Thornburn, is to be taken down and erected at the Acadia.

Another correspondent writes:—You will see that the Springhill strike is ended and a victory claimed for the men, but I understand it is not altogether on one side; the practice of docking is allowed and now recognized and several matters of practice put beyond dispute. Trade here continues brisk. Our hot weather is over and the country has been made green again by frequent showers.

The location for the proposed blast furnace is still undecided, though it is generally considered that the New Glasgow Coal, Iron and Railway Company favors the site between the Foord pit and New Glasgow, offered by the Acadia Coal Company in exchange for stock in the Company.

The strike diverted but little of the Springhill trade to this county.

The New Glasgow Coal, Iron and Railway Company has a large force working on its various iron areas. At the Cameron area, at Bridgeville, two shafts have been sunk to depths of 70' and 80' respectively. The shafts are about 200' feet apart, and are connected by levels following the vein. The vein varies in width from 5' to 27', and in the most northerly of the shafts continues to give an excellent quality of ore at depth. On the McDonald property a slope has been sunk for 300' following the vein. At a depth of 75' below the crop of the ore a level has been driven 200' south and 75' north, all in ore. At 150' below the crop of this ore the second level is driven 225' south and 100' north,

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in ore. Below this lower level the slope is continued for a distance of about 130', and the quality of the ore is found to improve towards the dip. The ore, however, is of an excellent quality throughout, the difference between the upper and lower parts being that there is a larger proportion of coarse ore to the dip. At Upper Stewiacke, the company has also opened a deposit of red hematite, and mined about 200 tons therefrom to date. At Brookfield, in Colchester County, operations have been continued upon the brown hematite veins occurring there, and a shaft to depth of 83' has been sunk. The crop of this vein is met at a depth of 15'. At 32', a level has been driven 150' west and 100' east, the average width of vein being about 22'. At a depth of 82' levels are now being driven, and the work so far done in them gives every indication of the vein holding out equal to that in the upper level to the west. At Black Rock, on the East River, Pictou County, some preliminary work has been done on a most promising deposit of brown hematite. Since operations were begun in July last year about 6,000 tons have been mined to date. The work is under the superintendence of Mr. R. E. Chambers.

The pay-roll of the Drummond Colliery for July amounted to \$17,000, the largest paid out in one month.

The bore-hole at the Black Diamond has been put down to a depth of 600 feet, but the results are not made public, which looks discouraging.

Cumberland County.

After nearly ten weeks strike the Cumberland Railway and Coal Company has, we understand, acceded to the demands of the men, and mining has accordingly been resumed at the Colliery. This most desirable end has been accomplished, we understand, very largely owing to the intercessions of the Hon. W. S. Fielding, the popular Premier of this Province. Commenting upon the strike and its consequences the *Journal of Commerce* has the following:—"Hardly a week has passed by that we have not had to chronicle the business difficulties of one of the local storekeepers, brought about simply from the impossibility of making sales for cash, or collecting payment for those made on credit. As a consequence the wholesale trade began in their turn to feel the turn of the screw, and thus from the pinched miner to the distant wholesaler, every link in the chain of commerce suffered from the unusual strain. If the version of the strike and its causes put forward by the miners be correct, and the fact that the company have never contradicted it would seem to indicate that it is, there were certainly grievances which the shareholders of the company should have put pressure on the management to abolish.

Press dispatches announce the sale of the Joggins Colliery to an English syndicate. We have not yet been put in possession of the particulars.

The Londonderry Iron Company is making preparations to work the extensive deposits of spathic ore at Londonderry. Gas kilns for roasting 250 tons ore daily are being erected. The old blast furnaces will be raised 15 feet, and capacity at each increased to 500 tons pig iron weekly.

A good deal of prospecting for coal is also going on in this county. The result of the work so far done at Salt Springs has not been so satisfactory as was anticipated, but Mr. Hall is still confident that he will yet strike something valuable. Mr. James Baird, manager at the Chegnecto Colliery, is also doing similar work near Maccan Station, on property owned by the Londonderry Iron Co.

Cape Breton.

Reports received here from the Nova Scotia coal mines indicate a season of unprecedented prosperity. So far the output of each mine, with the unfortunate exception of the Springhill colliery, is much larger to date than for the corresponding period last year. The shipments at the Caledonia mine, of which David McKeen, M.P., Cape Breton, is manager and director, amounted to 27,500 tons for the month of July, an average of more than a thousand tons for each working day.

Burchell Brothers, of Sydney, N. S., have purchased the Gardner coal mine. The new proprietors intend to equip and operate their mine at once. The Gardner is good coal, plenty of it, the mine well situated, and, doubtless, its present owners will take advantage of the growing demand in the Dominion and help to swell the yearly output at the Cape Breton mines by many thousands of tons.

Darr's Hill.

The Dufferin Mining Co. are pushing work in their new 20-stamp mill and hope to have it completed in September. It is intended to stamp 60 tons per day and to be more efficient than the old 40-stamp mill. The mill is modelled upon the Black Hills pattern.

Killag District.

Advices from this district state that the lode now working is looking better than ever. The quartz is from 9 to 15 inches in thickness, and will yield at the rate of 5 ounces per ton. Some of the rolls are reputed as valued at 10 ounces per ton. A level is being driven at a depth of about 30 feet to connect the two shafts. When this is completed the rich streak will be opened for over 75 feet in length. A recent break in one of the mortars in the mill prevents active crushing from being carried on immediately.

Renfrew District.

On the evening of the 11th inst. the large frame building at Renfrew, which contained the hoisting and pumping engines and air compressor of the Empress Gold Mining Co., was destroyed by fire. About six pounds of dynamite were in the building, and men were afraid to fight the fire until the same had exploded. The loss will not be heavy, as the machinery is reported as not seriously damaged. The Empress Co. is chiefly owned by Mr. C. H. North, of Boston, Mass.

South Uniacke.

The owners of the Witherow mine are doing but very little work. The main shaft has been sinking for a new pay-streak, which, at time of writing, had not been reached. The Thompson Co. continues to mine very small lots of very rich quartz. It is reported that the pay-streak has run out on one end of this property though still good on the other and.

Some Halifax men have been prospecting the property east of the Thompson line, but have, as yet, no results to make public.

Montague District.

The cessation of work upon the Rose Lode here, which took place some months ago, was not unexpected by parties familiar with the lode when it was working some years ago. The pocket from which the rich quartz was milled last winter is said to have been only a fragment of the rich streak formerly worked, and the continuation of the streak beyond the break is yet to be found. With skilful management and a little capital expended in dead work this continuation should be found without difficulty.

Central Rawdon District.

Several falls of rock in the workings of the Northrup Mining Co., limited, are reported. So far, they have occurred chiefly in the older part of the mine, and the old shaft is reported as closed up. The wall rock slacks and swells very rapidly upon exposure, entailing constant watchfulness upon the management.

Colchester County.

The Colchester Coal Mining Company have done some preliminary work on their area at North River, above Onslow. The indications are so encouraging that arrangements are now being made for new machinery plant for more extended working. About 100 feet of a slope is now completed, with a gin for hoisting, double track, trolleys, etc. Up to the 1st of the present year about \$1,500 have been spent in development.

In General.

The next regular monthly meeting of the Gold Miners' Association of Nova Scotia will be held at the Halifax Hotel, on Friday afternoon, the 5th September, at two o'clock. A large attendance of members is particularly requested.

The property and machinery plant of the Brunswick Gold Mining Company will be sold at public auction by the sheriff, at the County Court House, Halifax, on Saturday, 13th September next.

The Stanley Gold Mining Company are applying for incorporation. Capital, \$40,000; head office, Westville. Directors: John McDougald, M.P.; John Bryson, M.P., and Duncan McGregor. The company's property is at Fifteen-Mile Stream.

The Lawson Antimony Mining Company are also seeking incorporation. Capital, \$50,000; chief place of business, Halifax. The directors include Robert McNaughton, Truro; B. F. Pearson, and Charles Annand, Halifax. The properties to be acquired and worked are in the Rawdon District.

Quebec.

The output from the mines of the Johnson's Asbestos Company, Limited, at Thetford, for the present year promises to be between 1,200 and 1,500 tons, No. 1 and No. 2 quality. At date a little over 2,000 tons of No. 3 are on hand.

A correspondent from the Beauce district sends the following: "Gold mining in this district has been very quiet, due, I expect, to the failures of the Colonial Gold Mining Company, and the Gold Mining Association of Canada, and this, not because the gold is not here, not

because there is great difficulties in the way of its extraction, but simply because of excessive extravagances on unnecessary works and methods of mining. In prospecting the property of the former Company, which I have since purchased, I discovered an old river-bed in the hill called 'Jersey Point', at the juncture of the DuLoup and Chaudiere rivers, and from one pan of dirt I found a pennyweight of gold. I have also found a quartz vein carrying free gold. There is no quartz-mill or crusher in this district, and as I think they are greatly needed, I am prepared to make any arrangements with any company that will come and put one up. Any company favorably disposed to do this would receive encouragement from our municipality in the way of a remission of taxes for a number of years."

Eastern Townships District.

The Memphremagog Mining Company purpose erecting shortly a smelting plant to treat the ores from their mine in the Township of Potton. A small force is employed opening out the property, and a large quantity of ore will not be raised until the smelter is in place. It will be remembered that this company mined an output of some 2,000 tons last year.

BELL'S ASBESTOS COMPANY, LIMITED.—The directors have declared an interim dividend of 10s. per share (free of income tax) for the half-year ending June 30 last, being at the rate of 20% per annum, payable by warrant on the 31st inst. to the shareholders on the register on the 26th inst.

The shipments of copper ore from Capelton Station, from 1st January to date, amount in the aggregate of 27,571,400 lbs., or a little over 13,785 tons.

Ottawa Valley.

The shipment of phosphate from the mines of the Canadian Phosphate Company from opening of navigation to date have been:—

No. I.—(80 to 85%	1,338 tons.
" II.—(70 to 75%	1,864 "
" III.—(60 to 65%	506 "

3,708 tons.

At the Aetna Hill and Lansdowne mines, operated by the Anglo-Continental Guano Company, under direction of Mr. J. B. Smith, considerable activity is manifest, and the shipments for the year are expected to be figure close upon 3,000 tons.

The completion, or rather the non-completion of the works at Little Rapids, is again causing great trouble and inconvenience to the miners on the Lievres. Two scows, belonging to the Canadian Phosphate Company, had the misfortune to get on the rocks at the rapids this week, and suffered considerable damage thereby. The Department of Public Works promised that the work should be finished this year, but judging from appearances it will probably be a couple of years yet before this bugbear is removed.

The new Ingersoll plant for the High Rock mines will be in running order by the end of this week. Mr. Pickford, sr., from London, Eng., is expected at the mines next month.

Mr. C. C. Hoyer Millar, of the firm of Couper, Millar & Co., London, Eng., will also visit the mines of the Can. Phos. Co. in September.

The boom in "prospects" and other properties held for speculative purposes, consequent upon the exaggerated ideas formed of the operations of the Phosphate Corporation, is dying out. Properties held a few weeks ago at chimerical figures have now lapsed into their old groove.

The Templeton mine-managers complain of the scarcity of labor, miners being difficult to get.

Prices continue good, and the prospects of a busy season are bright.

Ontario.

Port Arthur District.

(From Our Own Correspondent.)

THE CROWN POINT MINE.—A one-half interest in this property has been sold by Messrs. Cummings and Montgomery to H. R. & E. Tinkham, Hon. O. P. Stearns, Hon. J. D. Ensign, Geo. Elder, James Billings and C. E. Shannon, all of Duluth, Minn., the consideration being \$100,000.

The property is situated in the township of Lybster, about forty miles from Port Arthur. It is composed of location R95 and comprises 160 acres; it adjoins the Shuniah Weacheu Mines Company's property and the West

End Mining Company's land on the north. The location is traversed by three strong well-mineralized veins. No. 1, or the main vein, which is a true fissure, causing a fault of 9 feet, outcrops for three-quarters of a mile; it has a general east and west strike, and dips southerly about fifteen degrees; its average width is four and one-half feet; the vein gangue is composed of calc spar, fluor spar, zinc blende, and a small quantity of galena. It carries silver in the form of argentite and native, giving good results wherever opened, the lowest results from milling, ore giving 25 and the highest assays of smelting ore giving 2,980 ounces of silver to the ton of 2,000 pounds.

Nos. 2 and 3 veins outcrop on the top of the mountain and extend down over the east and west slopes respectively. They have the same general strike and dip as No. 1, and give every promise of turning out as well as it did on development, surface specimens taken anywhere on the vein, giving good assays in silver. The gangue has the same characteristics as No. 1.

The work done up to date consists of the following:—No. 1 adit level on No. 1 vein was started in 90 feet from the top of the mountain, some distance below the trap, and has been driven in on the vein for a distance of 150 feet; good milling and smelting ore was taken out of this level for its entire length.

No. 2 adit on No. 1 vein was started in at a point 65 feet below No. 1 adit and has been driven in a total distance of five hundred and seventy-eight feet on the vein. At a point four hundred feet from the mouth of No. 2 adit a winze has been sunk to a depth of forty-four feet; one hundred and forty feet in on No. 1 adit a winze has been sunk to connect with No. 2 adit. Another winze has been started near the breast of No. 1 adit and is now at a depth of 20 feet. There are five cross-cuts from 16 to 20 feet in length driven at different points on the levels. On the westerly end of the outcrop, about three-quarters of a mile from the workings described above, an adit has been run in on the vein for a distance of sixty feet; these workings are all below the overlying trap and in the Animikie slates. The vein has been left standing in the last one hundred feet of No. 2 adit, and a conservative estimate of the amount of ore in sight at this point places it at seventy-five tons of smelting ore that will average 400 ounces to the ton of 2,000 pounds.

There are 1,400 tons of good milling ore on the stock pile that gives average assays of 50 ounces to the ton.

During 1889 they made several shipments to Duluth smelters, some of which gave an average value of 852 ounces to the ton in silver. I have been unable to ascertain the quantity shipped, but one lot shipped on Sept. 19th, 1889, consisted of 17 tons.

The new company proposes to push development work with all possible despatch, and have decided to build a branch railway, one mile in length, to connect with the Port Arthur, Duluth and Western Railway. I understand it is the intention of the Shuniah Weacheu Mines Company to join them in the construction of this branch. This will give them first-class facilities for the transportation of supplies, machinery and ore. They also propose to erect a concentrating plant of fifteen head of stamps with power sufficient to run twenty-five head power drills, and a compressed air plant will be placed in position as early as possible.

It is also their intention to start another adit seventy-five feet below No. 2, which is designed to be the main working level of the mine. It will give them about 230 feet of back ground. Very little hoisting or pumping will be required for some time, as the workings are all above the common level of the country.

The force of miners will be increased as fast as men can be secured, and an early development of this promising property may be looked for, and from the developments already made it is reasonable to expect that future operating will give satisfactory results, and that the Crown Point will add one more to the famous silver producers of the Port Arthur district.

Messrs. Cummings and Montgomery are to be congratulated in securing the co-operation of such influential and wealthy gentlemen.

THE MOCAN VALLEY GOLD LOCATION.—This property is situated in the district east of Port Arthur, 3½ miles north of the Canadian Pacific Railway, at Jackfish Bay, Lake Superior. It is easily accessible from either the lake or railway, through the Mocan Valley, which is quite suitable for either a waggon or tramroad. The north end of the location borders on Mocan Lake, a deep clear body of water, about half a mile in length. The outlet is fourteen feet in width, and passes directly through the location, near the works on the vein. It makes a descent of 40 feet above and near the works referred to, and will give an excellent supply of water for all mining purposes. The creek lies in a valley that occupies the western portion of the location, the mountains rising on either side to a height of about 200 feet. The location and vicinity is well supplied with timber suitable for mining purposes.

The rock formation consists of the Huronian diorites

and chloritic schists, striking east and west, and dipping with a high inclination southward, with an occasional syenitic vein penetrating it from a great granitic syenite belt, which bounds it on the south side within a few hundred feet of the location. Several quartz veins intersect the location, two of which carry free gold. One of them, which may be said to be the main vein of the location, is in about the centre of the property, striking eastward across the mountain from the above-mentioned valley. It has been exposed in several places, over a distance of about a thousand feet from the foot of the hill, up the face and back on the summit. It is a strong fissure vein, from 2 to 6½ feet wide, of quartz, with an inch of clay on the foot-wall in the tunnel.

The tunnel was driven in on the vein for thirty feet at the foot of the mountain, twenty-five feet above the level of the valley. The vein here is four to seven feet in width, and carries considerable auriferous pyrites, assaying \$22 in gold per ton of 2000 pounds. On the surface, about fifty feet further east, the vein carries free gold, and it is expected that if the tunnel was driven in to cut that point it would show free gold also; in fact a few colors were shown in the last blast put into the tunnel. The vein in the tunnel dips 60° to the south. Thirty-five different tests have been made on this vein, in pulverizing, roasting and washing, and with few exceptions turned out a good showing of gold dust in the pan. A test of 1290 pounds, made by the North-Western Reduction and Chemical Works, of Chicago, of the rich part of the vein, gave an average of \$41.34 in gold to the ton of 2000 pounds. Assays from other parts of the vein, by C. Kreissman, M.E., of Port Arthur, gave an average of \$20 in gold to the ton of 2000 pounds. The second vein bears N.N.W., dips westward 30° to the horizon, and lies about fifteen chains to the east of the tunnel, and will interest the main vein. It is three feet wide, and is composed of decomposed quartz. No assays have been made from this vein, but it shows free gold in considerable quantities by panning.

The district east of Port Arthur is attracting the attention of explorers to a greater extent this season than ever before. Some very promising gold, silver and nickel properties have been located in the vicinity of Schreiber.

CLOUD LAKE SILVER LOCATION.—This property is situated on the north-east quarter of Lot 5, Concession 2, in the township of Crooks. The title has been in dispute for about a year, owing to rival claims made by different explorers. In April last the Ontario Government issued a Commission which held sittings in the court-house at Port Arthur. A mass of evidence pro. and con. was submitted during ten days. The commission reported some time since and the Government have finally decided to give each of the two claimants an undivided one-half interest in the property. The location comprises 174 acres and is traversed by two strong, well-defined and heavily mineralized lodes. No. 1, or the main vein, has a general north-east and south-west strike, with an average width of 5 feet and can be traced for one thousand feet. No. 2 vein has an east and west strike with an average width of four feet; it joins No. 1 about the middle of the outcrop; from the point of intersection eastward as far as the vein is exposed it has an average width of 8 feet. A shaft 12 feet in depth has been sunk at the contact of the two veins. The lowest assays from rock taken taken out of the bottom of this shaft, showing no silver, was \$300, and the highest from rock showing argentite, zinc blende and galena was \$2,900 per ton. Development work has been commenced and good results may be looked for.

TERRACE BAY GOLD MINING COMPANY.—This company's property comprises 1,600 acres and is situated on the shore of Terrace Bay, a few miles west of Jackfish Bay, Lake Superior. Mr. Roland, M.E., who has lately made an examination of the property for the owners, found it to contain several well defined and highly metalliferous lodes. The geological formation prevailing throughout this tract generally is Laurentian; occasionally as towards the northern and eastern limits rocks of the Huronian age are encountered. The gangue of the veins, as far as tested, consists of fine quartz, of a granular, and in places vitreous, texture and appearance, carrying chalcopryrites, highly auriferous, argentiferous galena, and molybdenite, while the walls are invariably slicken-sided with pyro-schist, the matrix being occasionally streaked with red orthoclase. An average of twenty-five pounds of this chalcopryrites yielded by assay \$13.50 per ton of 2,000 pounds. The principal testing work was done on location No. 4 where, on a strong well-defined lode, bearing north nine degrees east, a drift was run in 45 feet. This lode is joined at intervals of about ten feet with heavy mineralized "feeders" from the south and east. The lode improved very fast, as the drift was driven in on it. The concentrates from the ore taken out give excellent result. I believe it is the intention of the company to proceed with the development

of the property. It is splendidly situated; the Canadian Pacific railway runs through the property and the harbour facilities are of the best.

THE BEAVER MINING AND MILLING COMPANY.—This company shipped two carloads of smelting ore and concentrates on the 2nd inst. to Messrs. Balbach & Sons, Newark, N. J., valued at \$40,000. Capt. Hooper expects to be able to ship from \$25,000 to \$40,000 monthly, and taking into consideration the amount of ore on the stock pile and the developments made in the mine, it is quite reasonable to expect that he will be able to do so. New ground will continue to be opened up and the extent and number of the veins on this property gives them great opportunities for work of this kind. They have at present on hand at the mill and ore-house about two carloads more that will be shipped shortly.

THE BADGER SILVER MINING COMPANY.—This company shipped 17 tons of smelting ore and concentrates on the 4th inst. to Geo. W. Robinson, 91 Wall street, New York, valued at \$37,000. This is the product of No. 2 vein since its discovery on the 8th June. Superintendent Shear says he can guarantee shipments of \$35,000 monthly from the Badger property this year. Everything is going on very smoothly. They have 480 feet of ground opened up on No. 2; it has become richer at the west end than at any point yet opened. Several stringers came in from 75 to 100 feet west of the shaft, everyone of which was literally filled with argentite. A Cunningham twin engine, friction drum steam hoist has been placed in position at No. 3 shaft. An adit level is being run in to cut the vein 60 feet below the bottom of No. 4 shaft in the slates. Good milling ore, assaying from 100 to 150 ounces of silver to the ton, is being taken out of No. 3 adit and shaft. Drifting is being pushed on the west end of No. 1 vein. The vein is widening out and becoming stronger as the drift is driven in. Some of the ore is very high grade, going up to 700 and 800 ounces to the ton, the average of the vein is about 125 ounces, and from all appearances it will improve very shortly. The mill is running full blast night and day, treating 35 tons daily.

THE WEST END MINING COMPANY.—This company's property has been sold to Elias F. Drake, of St. Paul, Minn., representing a syndicate of wealthy capitalists, for \$150,000 cash.

It is situated in the township of Lybster, and adjoins the Shuniah Weachu Mine Company's property. It comprises 240 acres. There is a steam hoisting and pumping plant, and about twenty buildings, including superintendents' residence, store, blacksmith shop, boarding house, miners' dwellings and ore house on the property.

The location is traversed by four good veins, and with the exception of some surface work, only one of them has been developed. It is a true fissure vein, averaging six feet in width. It outcrops on the Shuniah Weachu Company's land, and is exposed clear across the West End Mining Company's property, carrying a uniform width throughout; the entire length of this vein on the property is slightly over half a mile. It is very rich in silver, carrying it in the form of native and argentite and highly argentiferous zinc blende, the vein matter giving assays from 40 to 5,000 ounces to the ton of 2,000 pounds. In October, 1889, the writer saw 26 bags of ore taken out of the cross-cut, mentioned below, that would average not less than 7,000 ounces to the ton, principally native silver.

So far the work on the property has been confined to development, no stoping having been done. The object of Mr. H. N. Nichols, a thoroughly practical mining man from Denver, Colorado, who has been superintendent, has been to open up, and place the property on a good paying basis, before attempting to take out any ore, other than what was encountered in the course of development work.

The work done consists of the following: No. 1 shaft has been sunk to a depth of 225 feet. 75 feet down levels were run east and west 175 and 100 feet respectively. 140 feet from the surface the second set of levels were driven east and west 75 and 50 feet on the vein. No. 2 shaft is 65 feet in depth, and drifts have been driven each way on the vein for a distance of 125 feet. No. 3 shaft has been sunk to a depth of 50 feet, and No. 4, which was commenced a short time since, is 15 feet in depth; in addition to the shafts winzes have been sunk between the levels in No. 1 shaft, and a cross cut has been run into the face of the bluff to intersect the vein east of No. 2 shaft, and a drift, 125 feet in the vein from breast. The cross cut workings are all No. 1 vein, and the shafts are 650 feet apart.

In the course of this development work 15 tons of smelting ore has been taken out and shipped to Denver smelters, and the stock pile contains about 2,000 tons of good milling ore, 1,000 tons of which will average about 100 ounces to the ton, and the balance 40 ounces to the ton. I understand that it is the intention of the new owners to put a large force of men at work and develop

the property on a large scale as soon as the railway reaches that point, which will be about December next, a large concentrating plant will be erected.

(Later Correspondence to the Review.)

THE BADGER SILVER MINING COMPANY.—In No. 2 shaft sinking has been resumed below No. 1 level, and a winze is being sunk 175 east from the shaft. Drifting still continues west on No. 1 level. All these workings are being done on the vein, which continues just as rich as when I reported it last. The new steam friction drum hoist is now in place at No. 3 shaft and is giving excellent satisfaction. No. 1, or the lower adit level at this shaft, is now in a total distance of 300 feet, 90 feet of which has been driven since the Badger Company acquired it. This property (Porcupine), the whole of this distance has been in good pay ore and has steadily increased in richness, the last 30 feet being all bonanza ground. The vein is strong and regular with an average width of 3 feet. The gauge of the vein is principally calcite, carrying both native and black silver. On the hanging wall there is a band of witherite varying in thickness from 2 to 8 inches, and very rich in argentite. This band appears to continue through the hill, as they have the same streak in the shaft 500 feet east from the breast of the level. Sinking was commenced last week in the shafts. They have 14 feet more to sink to reach the depth of No. 1 level, at which point drifting will be commenced to connect through to the level. There is every reason to believe that the rich body of ore they now have in No. 1 level continues through to the shaft, as the bottom of the shaft is now in bonanza ground of identical character.

Drifting is being proceeded with at the west end of No. 1 vein. The vein is becoming stronger and better defined, carrying good pay ore all the way. The mill is kept going night and day. Another large shipment of high grade smelting ore and concentrates will be made in a few days. Geo. W. Robinson, of New York, general manager, and one of the principal owners of the property, visited the mine this week in company with his family. The Badger stock, which has a par value of \$5, sold one month ago for \$6, cannot be purchased now for less than \$22, and most of the holders refuse to part with it for less than \$50 per share.

Numerous sales of mining locations have been made within the past few days in the silver district, the early event of the railway, no doubt, is the principal cause of the movement. Intending investors would do well to secure lands now, as when the railway is completed to Whitefish Lake it is bound to increase the value of mining lands, and consequently the price at which they can be purchased.

A. P. Bliss, of Saginaw, Mich., who purchased the Palisades location for \$10,000 and has since refused \$20,000 for it, purchased on the 13th inst. R. 58 and R. 59, containing 80 acres each, entirely undeveloped, lying immediately west and east of West End mine and Shuniah Weachu mine respectively, for \$40,000 cash. Two days after the purchase he refused an advance of \$3,000 on the price he paid. It is his intention to place all these properties under development early in 1891. R. R. Paulson, the iron king of this district, purchased R. 255 for \$1,000 cash, an 80-acre location lying west of Sand Lake, on which there is a good silver vein and a very promising outcrop of iron, both of which are developed. Two silver locations, lying north of Whitefish Lake, in the Township of Strange, were sold last week for \$300 and \$500 each, and changed hands in a few days at an advance of about 500 per cent. each. Numerous other transactions in mining lands are on the tapis, some of them involving large amounts of money are reported, and while it cannot be said to be a boom, it is safe to say that it is the legitimate outcome of the rich and satisfactory developments already made in the district, and which will soon be increased by the facilities afforded by the railway.

Capt. Wilson has had a gang of men out testing R. 366 lying a short distance north-west of Sand Lake, and reports having found leaf silver in the gneiss, which at that point is 11 feet in thickness. He has great faith in finding good silver in this formation, and his results so far certainly appear to bear him out. No work of any consequence has been done in ground of this kind in this district, and therefore his theory cannot as yet be disproved. His work will be watched with great interest, as this formation joins the "Animikie" slates on the north-west.

THE SILVER ISLET CONSOLIDATED MINING AND LAND COMPANY.—Capt. T. H. Tretheway began operations on the 13th inst. at the new parallel vein on Edward's Island. A shaft will be sunk on the vein to the point of intersection of the old or No. 1 vein. It is expected that a rich body of ore will be struck at this point, as both veins carry silver in good quantity on the surface. The dip of each will bring them together 75 to

100 feet from the surface. No. 1 carries arsenical ore, giving assays from 150 to 700 ounces of silver to the ton of 2,000 pounds. Their property at Cap en Gargantua has been re-surveyed. This is the property that has the manganese vein, averaging 10 feet in width and standing up like a dyke over the surface of the ground. At the time of discovery, about two months ago, average samples from the surface of the vein were assayed by Chas. Brent, M. E. Port Arthur. They gave an average of 39.80% manganese. Check assays made for the company in New York gave a somewhat higher percentage in manganese. This property will be thoroughly explored by means of a diamond drill and sinking a number of shafts at different points on the vein. The Cape Maimase lands will also be thoroughly explored and tested. It is expected that this company's operations will assume large proportions very shortly. Mr. H. S. Sibley is expected here about the 25th inst. He will be accompanied by an expert, who will examine and report on some of the company's lands.

THE ELGIN GOLD MINING COMPANY.—The property of this company is situated at Jackfish Bay, Lake Superior. Some development work was done there in 1884-5, which gave very satisfactory results. The vein carries free gold and highly auriferous pyrites. Capt. J. H. Dickie commenced operations on the 4th inst. with a gang of ten miners to open up the old works and drive a new drift in on the vein. The Canadian Copper Co. of Sudbury are largely interested in this property, and if Capt. Dickie's report is favorable, smelting and concentrating works will be erected and the property worked on an extensive scale.

Lake of the Woods District.

Owing to the delay in the completion of the new Reduction Works a petition is being circulated for signature in Rat Portage for the forfeiture of the bonus promised by the town. The postponement of the completion of the works is due, in large measure, to the difficulties experienced with the customs officials in passing in the machinery plant, to which reference was made in our last issue.

Sudbury District.

The production of copper and nickel ore from the mines of the Canadian Copper Company for last year is officially stated to have been 60,000 tons. No. 1 furnace was blown in for the first time on December 24th, 1888, and ran from that time to December 31st 1889, 259 days of 24 hours, using 31,268 tons of ore and producing therefrom 3,849 tons of matte, averaging probably about 18 per cent. copper and 13 per cent. nickel. In this operation there were consumed 3,950 tons of Connells-ville coke, costing about \$6.50 per ton at Sudbury. Smelter No. 2 started September 4th, 1889, and ran 73 days from that period to December 31st, using 9,740 tons of ore and producing 1,210 tons of matte, averaging probably about the same per cent. copper and nickel as No. 1. This furnace consumed 1,169 tons of coke. Shipments have been made to Philadelphia, New York, Swansea, Liverpool and Hamburg. Coke is shipped by boat from Cleveland to Algoma mills, and thence over the Canadian Pacific Railway to Sudbury. The shaft at Copper Cliff Mine is sunk at an angle of 45°. On the 31st December, 1889, it had reached a depth of 502 feet, and the width of the ore deposit at that depth was 65 feet; the present depth (on slope) is about 458°; about 300 men are employed.

The Dominion Mineral Company's smelter has had to be shut down, their supply of roaster ore having given out.

The smelting works recently erected by the Vivians, of Swansea, will soon be ready to treat ore from their mines.

Kingston District.

(From our own Correspondent.)

At the pits of the Foxton Mining Company, after having done almost nothing but "dead work" since the beginning of the year, a large body of high test phosphates has again been struck, and the output has consequently very materially increased. The force will be increased to 45 men.

At the "Orser" phosphate mine, 11, 11, Loughboro', five men are employed. The output is as yet slow, a good deal of time being taken up in opening, as it is a new mine. It is intended to largely increase the force after harvest. The prospects are very good here.

The Sydenham M. & M. Company opened in spring a new phosphate property on 12 in 8th con., Loughboro. It was not successful at first. About two months ago they struck a very large vein, and since then have taken out about 250 tons. 17 men are now employed. When some "dead work" now being done is finished, it is expected that a good output will be made.

Fred. Foxton is opening on W. $\frac{1}{2}$ 5, in the 8th, Loughboro. Not much done yet.

Rock Lake Mine, (Bell & Claxton.) Some time ago water got into the large pit—beyond control of the machinery at hand—and work had to be abandoned there for the present. It is intended to remedy that immediately by putting up a powerful plant, &c. Eight or ten men are working in small pits. 422 tons of phosphate have already been shipped this season, and about 100 tons are lying at the mine ready for shipment.

Messrs. James Richardson & Sons, Kingston, expect to ship at least 4,000 tons of phosphate this year.

The Sydenham Mica and Mining Company have now employed at their mica mine near Sydenham (lot w. $\frac{1}{2}$ 11 in 7th con., Loughboro) 15 men. The shaft is now 160 feet deep. At their shop in Sydenham, where the mica is cut, 12 men are employed. At their white mica mine in Effingham they employ 10 men.

Webster & Co. have discovered and opened a dark mica mine on 16 in the 9th, Loughboro, the lot on which is situated the old Frontenac Lead Mining Company's works. Five men are now employed. The mica is said to be of very good quality and abundant.

Fred. Foxton is opening a mica mine on W. $\frac{1}{2}$ 5 in the 8th Loughboro. The mica is good, but the productiveness has not yet been ascertained.

Chas. Orser is opening on 11, 11, Loughboro, where the mica is also good, and indications point to its being in quantity.

In General.

The Haliburton Mining Company, owning some 1,200 acres in the 11th, 12th and 13th Concessions of Lower Monmouth, has a small force prospecting under superintendence of Mr. F. S. Miller. Some promising deposits of phosphates have, we understand, been opened up.

The Premier Oil Company, which recently purchased the plant of the Producers' Refining Works at Petrolia, give notice of application for incorporation. Capital stock, \$150,000. The directors of the new company are Wm. Brough, Toledo, Ohio, S. Cunningham, Washington, Robert Reid, Montreal, R. K. Thomas, Montreal, and R. Menzie, Petrolia. New underground tanks have been constructed, pipe lines laid, new condensers and stills erected, and many other improvements in the way of buildings, water works, increased facilities in every department, etc., are under course of construction. Another month will probably see the completion of the firm's proposed works, when the whole will be immediately put into operation. Among those interested are capitalists from Pennsylvania, Ohio and New York.

The Frontenac Phosphate Company, recently organized, is equipping its mine with a new machinery plant. The shipments of the company will be made per Messrs. Millar & Company, Montreal.

The Citizens' Natural Oil and Gas Company, of Kingsville, Ont., struck a fine flow of natural gas in their well near that town a few days ago. This well is about 300 feet from the great gusher No. 1 of the Ontario Natural Gas and Oil Company, and about the same depth—1,020 feet. It is estimated that the flow of gas will be about 15,000,000 cubic feet a day.

Manitoba and N. W. T.

Mr. Geo. H. Campbell, President of the Manitoba Railway and Coal Company was in Ottawa during the month, negotiating with the Department of the Interior respecting the land grant to his company. This company is the owner of some 2,000 acres of coal lands near the town of Deloraine, upon which some satisfactory prospecting has recently been done. A number of test pits, and a shaft to a depth of 60 feet, have been put down, giving abundant evidence of a profitable output when mining operations proper are begun. Mr. Campbell estimates that the company, when in working order, will be able to place about 50,000 tons of coal on the Manitoba market. Arrangements are being made for the immediate construction of the company's railway from the mines to Deloraine, and from thence to the city of Brandon, a distance of some 70 miles. The coal seam averages 7 feet, and, judged by recent analyses, is of good quality.

A meeting of the Canadian Anthracite Coal Company was held at Ottawa during the month, when it was decided to increase the present capital stock of the company from \$500,000 to \$1,000,000. Operations at the mines are to be resumed at once.

At the mines of the North-West Coal and Lumber Company at Canmore a good deal of activity has been manifested lately.

Mr. Brinkenhoff, the discoverer, and one of the original owners of the coal mines at Canmore, passed through the city on Saturday on the way to St. Paul to visit his family, after spending seven months in the mountains. An English company, known as the North-West Coal and Lumber Syndicate, has purchased the property above referred to, but Mr. Brinkenhoff still retains an interest in it. He says that two cars are now being loaded with coal, which is to be sent to Winnipeg to be tested, and it is expected that shipments will be made regularly afterwards. The mine will be operated as vigorously as possible. Mr. Brinkenhoff says that coal companies in the west labor under a disadvantage owing to the distance of mines from the chief markets and high railway rates, but he hopes to see the latter difficulty removed ere long. As the people in the smaller towns along the lines of railway are beginning to use coal as fuel, the consumption in this country is gradually growing, and must soon reach great proportions.

British Columbia.

The miners at the Wellington collieries are still out on strike, the men refusing to work because the Dunsmuirs, who are the owners, would not give consent to the following demands:

- "First—To work eight hours from bank to bank.
- "Second—Recognition of their men as a union.
- "Third—And their committees be empowered to investigate in all differences between employer and employees."

Commenting on the matter the *Colonist* has the following pertinent remarks:—"The eight hour shift has obtained in Wellington for years, but the time is counted from the hour in which they actually begin work until the hour they leave off. What the miners wanted was to have the day's work to begin when they were on the bank ready to go down into the mine, and to end when they were on the bank again in the evening.

"These conditions may be of importance to the miners, but the question is whether those whom the miners looked up to for guidance and advice were warranted in urging them to strike if they were not conceded. They knew, if the miners generally did not realize it, what a lengthened strike involves, and granting that the men would be benefited if they obtained what they wanted, was the good to be gained of sufficient importance to justify so extreme a measure as a strike in order to obtain it?"

The Revelstoke Mining Company, organized in London, Eng., early in the present year, is reported to have recently acquired the No. 1 and "United" mining claims, as well as a two-third interest in the "Great Eastern" and one-half interest in the E. W. R. The No. 1 was bought from Velnoweth and Duncan for \$15,000, and the E. W. R. and Great Eastern from the same parties for \$1,000. The United was got from Hugh and Tom McGovern and James E. Dolan for \$7,500—the total purchases amounting to \$23,500. These investments were made with the object of supplying the Revelstoke smelter with ores from the Hot Springs district of Kootenay Lake. The No. 1 has already made a record as an ore-producer, it having been under bond to G. B. Wright, who is said to have shipped \$25,000 worth of ore from it in 1888, and fully as much has been expended on it in development.

From all reports it would seem that West Kootenai will be represented by a first-class mineral exhibit at the Toronto Exhibition next month.

The Island Mountain Mining Company, located near Barkerville, B.C., has its mill nearly completed, and will commence crushing in a few days.

Mr. Lyman Banks, representing eastern capitalists, has bonded 7,000 acres of coal lands at Fort Rupert, Vancouver Island. He has also purchased in the States a diamond drill with a complete outfit of mining machinery. Mr. Banks left on Friday by steamer *Boscovitz* for Fort Rupert. He was accompanied by a party of experts, and boring will be prosecuted at once with every prospect of success.

At a recent meeting of the Crow's Bar Mining Company it was estimated that the preliminary expenditure on the company's claims would not exceed \$6,000. The water will be brought from a height of about 3,000 feet above sea level and traverse about 18 miles of country through ditches and lakes, with a final fall of about 2,000 feet through a ditch about 12 miles long, of which nearly four has been already constructed.

The establishment of mining associations in different parts of the Dominion is a feature in the development of our industry which cannot be too highly commended. When properly conducted these excellent institutions have proved of great mutual benefit, and have exercised a most wholesome influence on many public questions affecting the welfare of the miner. Were there more of them in our mining districts there would be fewer objectionable features in mining laws; the prohibitory effect of our tariff on imports of mining machinery would be diminished, if not abolished; there would be less booming and misrepresentation, and more vigorous development at our mines, and the industry all round would be in a much more prosperous condition. The latest acquisition, which we heartily welcome to the ranks of those already organized, is the Miner's Association of Revelstoke, B.C. As the Executive Committee state in an address appended to the constitution of this new association, experience has shown that action on the part of the miners of British Columbia is absolutely necessary in order to prevent legislative measures which, if passed, are calculated to inflict serious injury to the mining interests of that Province. We wish the association every possible success.

Our Portrait Gallery.

Owing to business changes our engravers are unable this month to furnish our readers with the portrait for our fifth sketch. The series will, however, be resumed in our next issue and continued regularly thereafter. The subject of our next sketch will be that of Mr. John Bowron, Gold Commissioner for the Caribco District, British Columbia.

Lake of the Woods Gold District.—W. Roland, C. and M. E., has just returned from making an examination of the Stewart locations, Nos. 250 P and 288 P, situated on the line of the Canadian Pacific Railway at Rossland Station. The property comprises 220 acres, and is traversed by three veins, two of which are exceptionally well defined. The veins have a general north-east and south-west strike. The country rock is of the Huronian series. Several test pits were sunk under his supervision, at intervals, on each of two of the veins. Average samples were taken from these pits, and gave the following results on assay by Chas. Brent, M. E., Port Arthur:—

Sample No. 1,	4.89	ozs. gold
" " 2, from hanging wall	5.32	" "
" " B, from most southerly point	3.48	" "
" " 4, from most northerly point	6.92	" "
Check assays made by Prof. Heys, Toronto, gave:—		
Sample No. 1,	4.65	ozs. gold
" " 2, from hanging wall	5.48	" "
" " B, from most southerly point	3.42	" "
" " 4, from most northerly point	7.00	" "

Concerning Belgian Miners.—A correspondent of the Leeds *Mercury* writes as follows:—"Mr. T. Lindsay Galloway, M.A., F.G.S., some time since paid a rather lengthened visit to several of the principal European coal mining districts, including a number in the north of France, Germany, Austria and Belgium, and he embodied what he had seen in an interesting paper read before the North of England Mining Institute. The mines of Belgium, he states, are a prolongation of those in the north of France, and, owing to the strata upon the southern side of the basin being literally crumpled into folds, there is great scope for the resources of the art of mining. At the *Produit* mines, in the vicinity of Mons, females are employed, as is the case at the mines generally in Belgium. The men work in companies of five or seven, and are attended by two females, known as the *bouteur* and the *chargeur*. The *bouteur* is generally a young girl, who collects the coal into a heap at the rail ends, which the *chargeur* fills into tubs. The females are dressed in jackets and trousers, the younger ones working from 4 a.m. to 3 p.m. which is the same shift as the hewers, being eleven hours.

A Seller's Regrets.—The *Coal Trade Journal* states that about two months ago William Moore, of Scranton, Pa., sold 100 acres of land situated in Dickson borough, just across the city line, to Messrs. Benner, Watkins and Williams, coal operators. The price was \$25,000. Soon after the land had been deeded over the owners erected a McEthen mine drill upon the place and in a few days the huge auger was penetrating the bowels of the earth. This set Moore to thinking, and two weeks ago he sought the coal operators and offered them \$30,000 to sell back, but the offer was refused. Recently the drill broke through a vein of coal 10 feet thick at the depth of 150 feet. The coal is of the finest quality, and there are "millions in it" for the new owners. The value of this land now is estimated at over \$1,000,000. This opens up a new coal sub-field, and in a locality where the presence of coal was not even suspected.

Improved Bee-Hive Coke Oven.

John Fulton, M. E., Johnstown, Pa.

The general plan of the bee-hive coke oven has held its place in the manufacture of coke with great firmness. It is venerable with age, and indeed has been sneered at because of its antiquity. Notwithstanding all this, it has kept quietly on its way, producing the very best possible coke from the coal used in its manufacture.

Multiplied attempts have been made to displace this most ancient of ovens, but these have so far accomplished very little. The 15,144 bee-hive coke ovens now in operation in the Connellsville coke region bear testimony to the appreciated value of this oven. The Connellsville coke is a standard coke so far as known on the continent of North America.

The physical and chemical properties of this bee-hive oven coke are fully shown in the table in the foot note below.

Its use in blast furnaces fully maintains the character given in the table. At a large furnace 1897 pounds of this coke produces one gross ton of Bessemer pig iron, and the output of the furnace is correspondingly large

(8,478 gross tons per month), exhibiting the energy and economy of this fuel.

In Virginia and West Virginia excellent coke is also being produced in the bee-hive oven, some of which approximates very closely to the Connellsville standard.

The Cumberland Valley Colliery Company, of Pineville, Ky., make a most excellent coke in their bee-hive ovens, one of which has been a surprise in the degree of its purity and physical properties, being somewhat superior to the standard Connellsville. Hence so far as the quality of the coke produced in this oven for metallurgical purposes, it is the peer of any other class of oven. It may seem strange that through its long years of faithful service very little improvements have been made in its general form or its details. Quite recently, however, the size of the oven has been enlarged so that the standard oven of the Connellsville region at present is 12 feet in diameter across its floor, and the height from the center of the floor to the top of the dome under charging port is 7 feet. This enlargement has been made with a primary view of increased output, and also reducing the percentage of waste at the door of the oven where air has to be admitted to mix with gases and support combustion in the dome above the charge of coal in the oven. The

door of this oven has been enlarged and its height increased so as to permit the air to be introduced at a level above the charge of coal in the oven, so as to have as little contact with the coal in introducing the air into the oven as possible, thereby lessening the ashes or waste that is made in this way.

The accompanying cuts (made from actual working drawings) illustrates the dimensions and manner of construction. In Fig. 1 is shown a transverse section of a bank of these ovens, the one at the left being shown completed, the right hand drawing illustrating the manner of construction. Fig. 2 shows the ovens in plan and Fig. 3 in elevation.

It will be noted also that in the general method of building these ovens a thinner variety of building stones are used. In fact, stones from three to four inches thick, make the best bond, and have greater endurance than the larger stones hitherto used in such structures.

The iron frame to the oven door has been modified by removing the arch piece, which was found in its expansion and contraction to shatter the masonry above the door. The frame, with its three sides, is sufficient to protect the jambs and posts of the doorway from the friction of the rabbling irons.

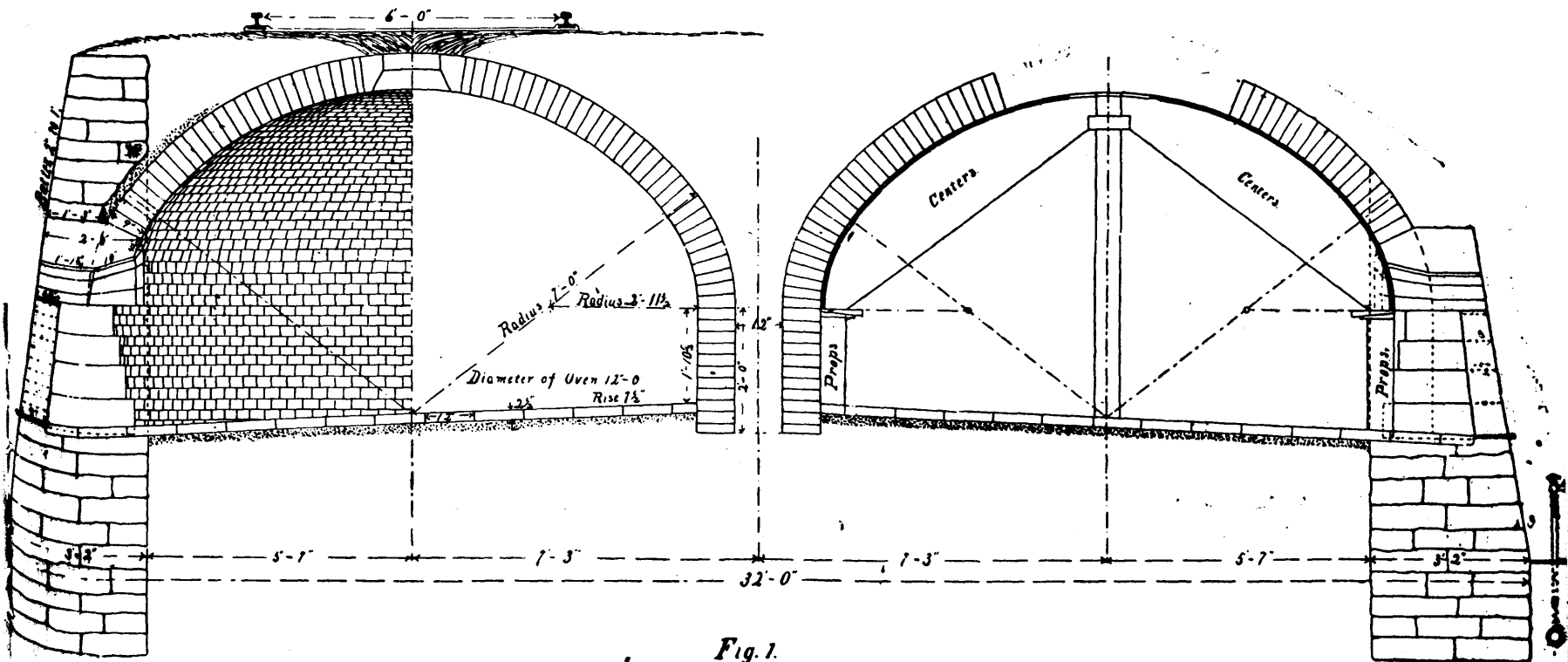


Fig. 1.

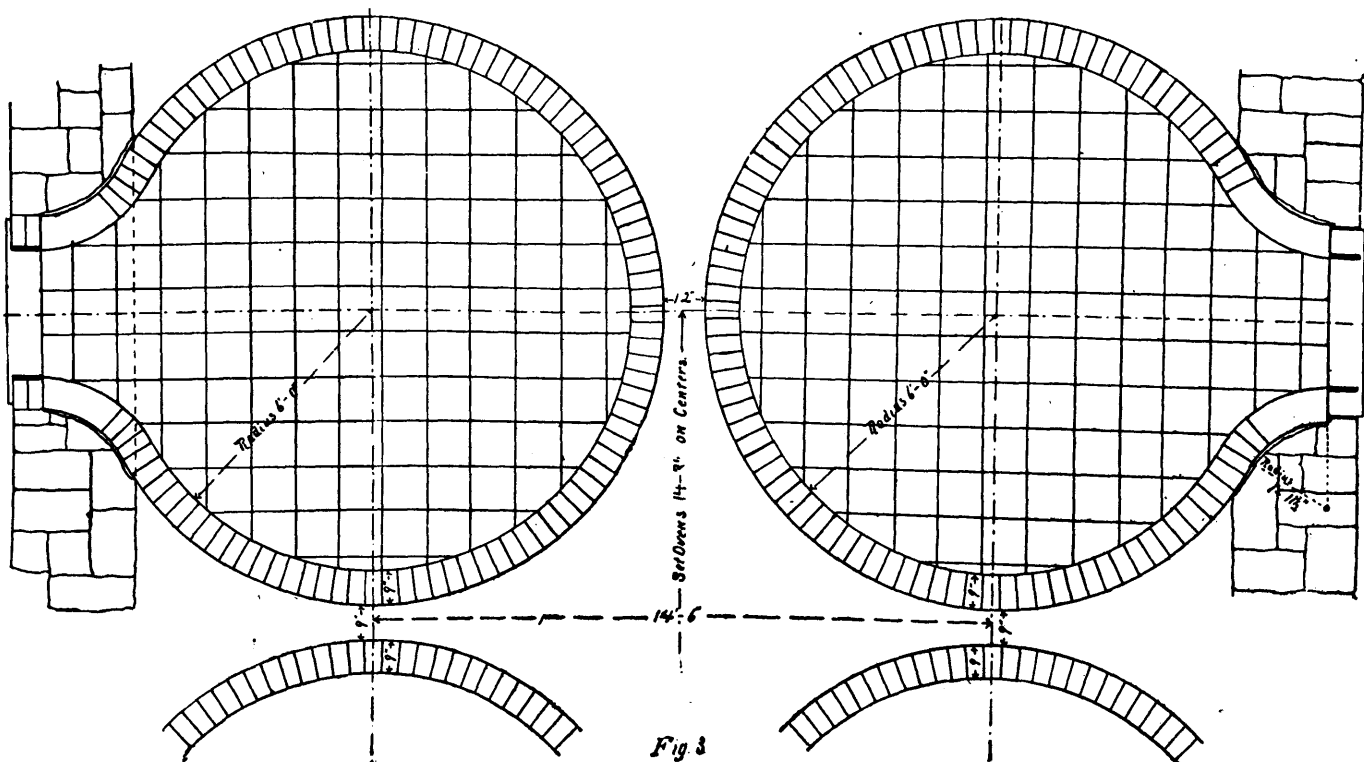


Fig. 3.

It is quite evident that further improvements can be made in this oven, especially in reducing the present heavy manual labor of drawing its charge of coke. It requires about three hours of hard work to do this, and the only compensating element in this expenditure of labor is in the fact of the coke being watered out in the oven and affording, as it is drawn out, a bright dry fuel; but it appears reasonable that some mechanical appliance can be introduced to this form of oven to discharge its coke more rapidly and at less expenditure of the men's labor.

The Adams coke oven, with its moveable bottom, which enables the operator to discharge the coke in from 10 to 20 minutes by mechanical means. An improvement of this kind is very much needed and should commend itself to those building new plants of ovens.

The following specifications will exhibit the important requirements in constructing the bee-hive ovens in a permanent manner.

SPECIFICATIONS.

Foundations.—The foundations for the masonry work shall be excavated to such a depth as may be required to give a permanent seat and assure stable work.

Masonry and Retaining Walls.—The masonry of the retaining walls of the bee-hive coke oven shall be built of sound sandstone in plates not exceeding six inches in thickness, well bonded. The first two feet of the foundation shall be laid dry, with large flat stones, carefully bedded, so as to afford the most permanent foundation. Above this the masonry shall be laid in lime mortar, composed of good lime and sand, in such proportions as may be directed, to be well and thoroughly mixed so as to insure thorough blending of the materials. The face of the wall shall be carried up with a uniform batter, as shown in the drawing, and have a workmanlike finish. The seats for the oven doors to be of selected and dressed stones, having their upper surfaces neatly bedded to receive the cast iron door frame.

Filling Under Ovens.—The filling under oven seats to be made in layers not exceeding one foot each in depth of earth materials, free from vegetable matter. It is to be wet and packed in a solid manner by rammers or rollers, so as to insure a permanent foundation for the ovens without shrinking or settling. The materials used for this purpose to be procured from such points as may be indicated by the engineer or person in charge of the work.

Building the Coke Ovens.—The coke ovens shall be built in accordance with the plans hereby annexed. They shall be founded on a circular base, or on a ring crossed by circular stone flags. The first section of the oven shall be circular, 12 feet in diameter, built with fire brick shaped for this special purpose, and lined in a true circle by a sweep pivoted on the center of the oven. The dome is to be built with appropriate brick by the sweep or on centers, as the engineer may direct. The whole to be keyed by the charge port ring on the crown of the oven. The door jambs and the arch brick are to be neat and carefully laid, so as to make strong work and good bond. The mortar to be used in the ovens to be composed of loam, or with loam and such mixture of clay as the engineer may approve. The tiles on floor of oven are to be laid in 12-inch layers, to be compacted with rammers, or in such a manner as will make solid work that will not settle so as to injure the oven. The filling on top of ovens to be carefully made and compacted as the engineer may instruct. The packing from the springing of arch to the top of oven to receive special care in compacting it, so as to insure the utmost stability to the ovens.

Filling the Wharves.—The wharves are to be constructed of such width as may be found most desirable; usually from 20 to 30 feet. The wharf retaining wall to be made of stones well bedded, with a slide batter, and of such height as to insure the most economical means of loading the coke into railroad cars. The pipes for conveying water to the ovens are to be placed at such depth under the surface of the wharf as to prevent any freezing during the winter season. The tracks for the larry on top should be laid with iron ties as shown in the drawing. The grade of the ovens to descend with the tonnage, so that the loaded larry will gravitate down the line of ovens. Usually one foot fall to the 100 feet long will assure this result.

The following estimate of materials for a bee-hive oven 12x7 feet will be found approximately correct: 1,250

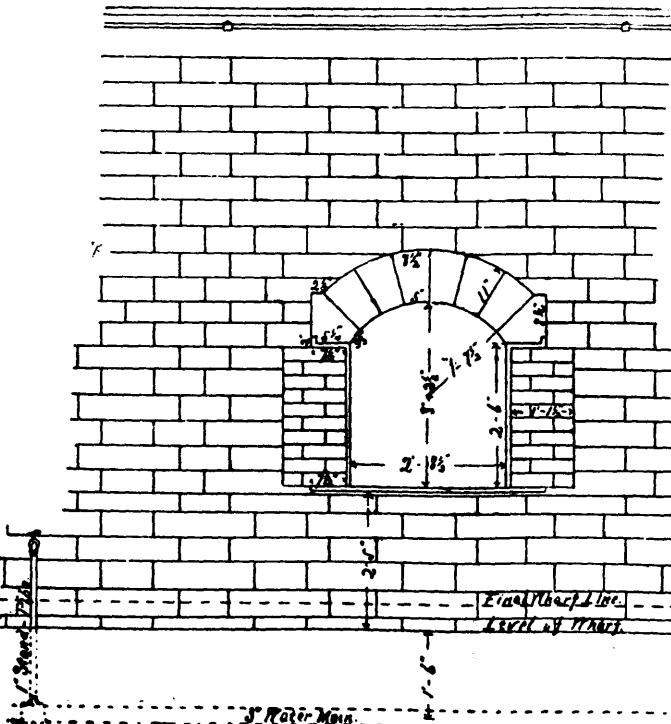


Fig. 2

lining brick, 400 skew brick, 2,000 crown brick, 130 tiles, 1 set of jambs, 1 arch, 1 port ring.

All fire-brick makers understand the quality of the brick and their shape, so as to meet the want of builders.

Chemical and Physical Properties of Connellsville Coke.

	Dry.	Wet.
Grammes in one cubic inch..	15.47	23.67
Pounds in one cubic foot.....	58.98	87.34
	Coke.	Cells.
Percentage by volume.....	49.96	50.04
Compressive strength per cubic inch (3/4) ultimate strength....		302
Height of furnace charge, supported without crushing.....		120
Order in cellular space.....		1
Hardness.....		3.5
Specific gravity.....		1.89

Chemical Analysis.

Fixed carbon.....	87.46
Moisture.....	0.49
Ash.....	11.32
Sulphur.....	0.69
Phosphorus.....	0.029
Volatile matter.....	.011

NOTE.—Reprinted by kind permission of the Am. Manfr. and Iron World.

A Coal Combination.—Her Majesty's Secretary of Legation at Washington has prepared a long report in the course of which he states that there was a case in Pennsylvania of a combination of coal companies—five of these companies doing business in that State and controlling a certain kind of coal—combined by means of an agreement that all sales should be made through a committee and one selling agent, and that prices should be fixed in the same way. After a time a quarrel arose between two of the companies, concerning a division of the profits, or of the fines imposed for sales, in excess of an allotment designed to limit production. One of these companies sued the other to recover its share of the sum so assessed. The Supreme Court of Pennsylvania held that the combination was illegal and void, and for that reason refused to aid the plaintiff. The Court went further. The mines of the company were in Pennsylvania, but the combination was completed and the purpose of it accomplished in the State of New York. The Court declared that the combination was not only illegal, but also that under the laws of New York it was a conspiracy, or as the judge said when referring to the case in the Sugar Trust decision, "a criminal offence." The fear is generally increasing that this control of respective industries "by trusts" will encourage the formation of others, and, in the end, that complete monopolies will be established over every necessary of life. Whether these apprehensions are well founded or not is a question which it has been as yet impossible to decide. The gravest evils laid to the charge of trusts are (1) the suppression of competition, (2) the exclusive power of regulating the prices of production and manufacture, thereby bringing the public at each end of the industry under their complete control. It is held that these trusts are the most dangerous to the public good by being the most guilty of the above charges, which owe their success in accumulating capital, and in beating down competition not possessed of power enough to withstand that accumulated capital, to persistent discrimination of the railroads in their favor.

LETTERS TO THE EDITOR.

Idle Mines in the State of New York.

KINGSTON, 25th August, 1890.

SIR,—A recent bulletin of the New York State Museum reports 30 mines of magnetic iron ore, 8 of hematite ore, 11 of bog ore and 3 of fossil ore, lying idle in that State. The output of iron ore in 1880 was 1,262,000 tons; in '88 only 4,000 tons more. There are in the same State, as we learn from another source, 14 anthracite, 1 coke and 8 charcoal furnaces out of blast. There is food for speculation in these figures which may amuse or edify those who trace our industrial inactivity in mining affairs to the American tariff.

Yours, etc., B. J.

Phosphate Shipments.

The ocean shipments from the Port of Montreal since our last issue to date are reported as follows:—

Date.	Name of Ship.	Destina-tion.	Shippers.	Quan-tity.
July 30	SS Dominion.....	Liverpool	Lomer, Rohr & Co.	250
Aug. 6	Ripon City.....	Hull.....	do	300
" 7	Mondego.....	London..	do	700
" 9	Soudan.....	Liverpool	Wilson & Green...	253
" 14	Grona.....	London..	Lomer, Rohr & Co.	55
" 14	Toronto.....	Liverpool	do	150
" 15	Grinum.....	H'mburg	Millar & Co.....	300
" 18	Sarnia.....	Liverpool	Lomer, Rohr & Co.	150
" 18	Catalan.....	do	Wilson & Green...	306
" 20	Ocean King.....	London..	Lomer, Rohr & Co.	90
" 23	Oregon.....	Liverpool	do	150
				2704

SHIPPER'S RECAPITULATION.

	Tons.	Bags.	Tons.	Bags.
Lomer, Rohr & Co., (to 19th June) ..	2,715	100		
do (to 23rd July).....	1,830	100		
do (to 23rd Aug.).....	1,845	..		
Millar & Co. (to 18th June).....	1,475			
do (to 15th July).....	1,540			
do (to 23rd Aug.).....	300			
Wilson & Green (to 16th June).....	823			
do (to 22nd July).....	2,132			
do (to 23rd Aug.).....	559			
Total European shipments to date.....	13,219	200		

RECAPITULATION OF EXPORTS.

	Tons.	Bags.	Tons.	Bags.
Liverpool, previously reported.....	5,816	100		
do reported to 23rd Aug.....	1,259			
Reported to date.....			7,075	100
London, previously reported.....	2,145			
do reported to 23rd Aug.....	845			
Reported to date.....			2,990	
Hamburg, previously reported.....	1,284			
do reported to 23rd Aug.....	300			
Reported to date.....			1,584	
Glasgow, previously reported.....	1,170	100		
Swansea, do.....	130			
Hull, do.....	300			
Total exports to Europe since opening of navigation.....	13,219	200		

The Progress of Canadian Railways.—There are in the Dominion of Canada 13,325 miles of completed railways and 416 miles under construction, representing a paid-up capital of £152,115,289. In 1889 the working expenses were £6,207,609, and the earnings £8,429,923, leaving a net income of £2,222,314. Over the 12,628 miles in active operation last year, 12,154,051 passengers were carried, and 17,923,626 tons of freight. During the past ten years the mileage of railways in the Dominion has more than doubled, while forty-six years ago there were only 16 miles of railway in operation over the whole of British North America. It is calculated that there is now one mile of railway to every 375 inhabitants.

The Desulphurization of Pyritiferous Iron-Ores.*

By Sterling G. Valentine, PH.D., Lebanon, Pa.,

(Continued from Page 108.)

Some pieces of Cornwall ore, similar to those used before, were heated beyond their sintering point, and as quickly as possible, to intensify the effect. For comparison the former results, obtained on heating at a low temperature, are added :

No. of Heat.	Temp. ° F.	Duration.	Per Cent. Total Sulphur in Residue.	Sulphur as Sulphide.	Sulphur as Sulphate.	Per Cent. Total Sulphur as Sulphate.
1	1200	3 hrs.	0.346	0.235	0.111	32.18
2	1200	4 hrs.	0.178	0.088	0.090	51.12
3	1500	1 hr.	0.099	0.027	0.072	72.72
4	2400	45 min.	2.125
5	2400	45 min.	2.422	2.337	0.085	3.50

Recalling the fact that the raw ore contained 2.664 per cent. of sulphur, the effect of the sudden fusion can be readily noted in the differences between the results of the first three heats of the last two.

The following are analyses of some clinkers taken from roasters working on Cornwall ore, showing the same effect :

Per Cent. Total Sulphur.	Sulphur as Sulphide.	Sulphur as Sulphate.	Per Cent. Total Sulphur as Sulphate.
1.397	1.224	.173	12.380
1.380	1.245	.135	9.782
1.873	1.777	.096	5.125

These results indicate plainly that the fusion of ores in roasting may prove prejudicial to good results. When it once takes place it is scarcely possible for desulphurization to proceed further. The vicid coating of fused iron oxide, silica and lime, or whatever may, in various cases, go to make up the impervious exterior, is a barrier both to ingress of air and egress of sulphur in any form. If the heat in any roasting process must be carried to so high a point, it should be gradually raised, and sintering should take place only after continued heating at a lower temperature in abundant air. I have frequently found pure sulphur condensed in the cavities of cold clinkers, where it had been vaporized from pyrites, but was unable to escape. Clinkering ore quickly is equivalent to roasting without air, and even more, for the sulphur that heat alone would vaporize is imprisoned in the mass. Furthermore, it prevents any great amount of the sulphur left from being in the form of sulphate.

Ledebur states that desulphurization will be the more complete the smaller the pieces of ore, the more freely air has access, and the higher the temperature or roasting.* It is easy to understand that small pieces means greater surface exposure and less requirement for penetration for heat and air. We have seen that air is absolutely needed for everything like a complete desulphurization. As to temperature, our results do not bear out the asserted necessity of a high heat for thorough roasting in all cases.

The practical application of all these conditions in the roasting of ores is a matter of no little difficulty. A proper roaster must be one in which the heat is under control, the ingress of air ample, and the egress of the products of combustion prompt. A gas-roaster seems to approach most nearly to these conditions. The Gjers kiln in any of its forms seems to be a very deficient apparatus for desulphurization, because it has none of these qualifications. Its effectiveness is about on a par with roasting without air, for little or no air can get at the ore while it is being heated in this style of kiln. Being fired with solid fuel, it is, as a rule, under little control as to temperature, and the greater number of them are chronically "clinkered."

The working of such a kiln can be seen from a few analyses at hand. At the Musconetcong Iron Works, in a modified form of this kiln, the results as given by Mr. J. P. Pardee (*Trans. xv., 680*), were as follows :—

	Per cent. Sulphur.
Raw ore.....	0.883
".....	0.68
Roasted ore.....	0.39
".....	0.29

Cornwall ore roasted in Gjers kilns gives the following results :—

Per cent. sulphur.....	I	II	III	IV
	80	1.41	1.05	1.12

As this ore runs from 2½ to 3 per cent. of sulphur, the analyses show only imperfect desulphurization, and are comparable to roasting out of contact with air. As a rule, not more than half the sulphur is removed.

The following conclusions may be drawn from this investigation, in regard to pyrite ores :—

1. Heat alone, without access of air, can remove, at best, only one-half of the sulphur present.
2. Atmospheric oxygen is absolutely necessary for a proper desulphurization.
3. Even at a low heat, ore is properly desulphurized if air can gain access freely to the FeS₂ in it.
4. Sulphate of iron can be decomposed by heat equally well with or without air.
5. In order that the residuum of sulphur in roasted ores may consist, so far as possible, of sulphates, the roasting must be done under free access of air.
6. Fusion or sintering of ore is likely to prevent any further desulphurization.
7. Sintering does not allow much of the remaining sulphur to be in the form of sulphate.
8. Fusion, hence, should never occur in roasting except after continued heating in air at a lower temperature.
9. Ores cannot be properly desulphurized in the upper part of the blast-furnace.
10. An efficient roaster must allow easy control of heat, abundant air access to the hot ore, and rapid removal of the products of combustion.

*Handbuch der Eisenhüttenkunde, p. 188.

The Future of the Port Arthur Silver Region.

"I believe," says Mr. Herbert R. Wood, in a paper read before the Canadian Institute, "this region must ultimately take a foremost place among the silver mining districts of America." My reasons are these :—1st. The universal excellence of the ore, while much is extremely rich, running as high as ten or twelve thousand dollars a ton; it is all good average mill-work. 2nd. The close proximity of the ten locations in the second group, all within a radius of three or four miles, leads one to believe the belt has plenty of out-crops awaiting the prospectors' pick. 3rd. As the depth of mining increases the value of the ore does not necessarily decrease, as the richest ore is in zones or pockets, liable at any moment to come into view. 4th. It is as yet a new mining region and but awaits the thorough and satisfactory trial of one or two mines to ensure the development of all. 5th. From a geological point of view the veins should all be rich, satisfactory mines. They trend with hardly an exception north-west and south-east, and are true fissures in all probability formed by the one convulsion of nature and similarly filled. The difficulties that have hitherto attended the development of this mineral region seem to have been in several cases the Temerity of the capitalists unacquainted with mining and the expenditure involved in sinking into rich zones of ore. In other cases properties have become mortgaged, mismanaged, till finally abandoned. What is needed is thorough mining men to take hold with lots of capital and push the mines and sink till the mine becomes a settled organization, working, yielding and paying.

Notes on Some Coals in Western Canada.*

By Wm. Hamilton Merritt, F.G.S., Toronto.

With the exception of the Vancouver Island coal, all the western coal fields owe their present development to the completion, in the autumn of 1886, of the Canadian Pacific Railroad. While it could not be expected that a very great deal could have been accomplished in three years, enough has been done to pretty thoroughly establish the coal-bearing areas and their correspondence with those which have been developed to the south of the boundary, along the lines of the transatlantic railroads in the United States.

This summer I visited some of the important developments in the coal areas of Washington Territory, largely with the object of being better able to appreciate the corresponding coal-bearing areas in British Columbia to the north.

In Western Canada coal-bearing rocks have been found in three zones :

1. In the plains to the east of the Rocky Mountains, and in the eastern flanking ranges, the coal occurs in the Cretaceous formation (including the Laramie).
 2. In the interior plateau of British Columbia the coal is found in the Tertiary formation.
 3. On the coast of British Columbia Cretaceous and Tertiary rocks are found carrying coal, and on the Island of Vancouver the well known Nanaimo coal has been worked for years in the first-named formation.
- In all these zones the coals vary from lignites up to higher grades, the factor determining quality being the amount of pressure to which they have been subjected. The intensity of this pressure is generally shown by the

disturbance which the coals exhibit, and, in many cases, is almost directly in proportion to the distance of the deposits from mountain ranges. This seems to be also the opinion expressed by Mr. Bailey Willis in connection with his Census Report on the coals of Washington. It has been elsewhere stated that super-imposed strata has been thought to have been an important factor in these changes; but my observations for several years in all these areas lead me to the conclusion that it is pressure alone from distortion and upheaval that has altered these western coals into the many varying grades in which they are found to exist.

In the first zone an enormous amount of coal occurs in the territory between the western borders of Manitoba and the Rocky Mountains. I shall merely note some of the seams, which are reached by rail, as examples of the character of the coals in the area mentioned. In the plains they are all lignites, changing to a high-grade lignite at the Galt mines (which are reached from the Canadian Pacific Railroad by a branch railroad 110 miles long), into a bituminous coking coal at the Bow River mines (where a 7-foot seam cuts across the main line of the Canadian Pacific Railroad), and finally, the maximum result of the metamorphic influence is reached in the Cascade Valley, where the pressure of the mountains on both sides of the Cretaceous trough, has altered the coal which it contains into an anthracite.

The following analyses, passing from east to west, convey some idea of the types of these coals :—

TABLE A.—EASTERN ZONE.

	a.	b.	c.	d.	e.
Water.....	20.54	10.30	6.50	4.41	0.71
Volatile combustible matter.....	33.26	34.40	38.04	40.32	10.79
Fixed Carbon.....	41.15	39.61	47.97	48.27	80.93
Ash.....	5.05	15.64	7.55	7.00	7.57
Total.....	100.00	100.00	100.00	100.00	100.00
Coke.....	None.	None.	None.	Good.	None.
Approximate distance from mountains, miles.....	234	128	36	28	0

a.—Medicine Hat, lignite (Geological Survey) fair coking.
b.—Crowfoot " " " "
c.—Galt " " " "
d.—Bow River mines, bituminous, " "
e.—Cascade Valley, anthracite, " "

In the interior plateau of British Columbia lignite and coal have as yet been found in only a few places. The following are the only occurrences yet discovered worthy of notice :

At Princeton, or Allison's, some 20 feet of alternating lignite and shale seams occur, lying at a gentle dip. The lignite can be obtained of a workable thickness, but the greater part of the bed is too much mixed with shale. The character of the lignite, as indicated by the analysis, is that of an inferior coal.

The lignite found at Marble Canyon, Hat Creek, is of a better description, as shown by the analysis. It is said to be of very considerable thickness. I did not think the quality sufficiently good to justify a visit to the place, which has been described in the Reports of the Geological Survey.

At Kamloops, close to the Canadian Pacific Railroad, coal of a very fair bituminous character has been found; but as yet seams of only about a foot in thickness have been opened up. The vicinity is being tested by a shaft.

In the Nicola Valley, some 49 miles from the railroad, a seam of bituminous coal, about 5 feet in thickness, has been exposed. This coal has been subjected to a greater amount of metamorphic influence than any yet discovered in this zone. It lies adjacent to a mountain, which is probably a result of the disturbance that has altered it into a good coking bituminous coal.

TABLE B.—INTERIOR ZONE.

	a.	b.	c.	d.
Water.....	15.75	8.60	6.26	} 36.065
Volatile Combustible matter.....	35.40	35.51	39.97	
Fixed carbon.....	41.45	46.84	48.22	
Ash.....	7.40	9.05	5.55	
Total.....	100.00	100.00	100.00	100.000
Coke.....	None.	None.	Fair.	Very good.

a.—Allison's, lignite.
b.—Hat Creek, lignite (Geological Survey).
c.—Kamloops, bituminous.
d.—Nicola, bituminous, (Geological Survey).

On the Pacific Coast zone, on the main shore, there has as yet been located a very small amount of coal and lignite, in the districts which correspond to the large areas

developed along the Puget Sound to the south of the international boundary. And, as has been ascertained to the south of the line, the coal which has been found near the coast is merely a lignite, but that which occurs inland, near the Cascade Range, has been altered into a bituminous coal. A sample of the latter type is found in a 2-foot, somewhat dirty, bed of coal, which has been opened on the slope of Sumas Mountain. Still further inland, the Cretaceous conglomerates occur near Chillawack, but all the coal which they have so far been found to contain consists of a few small masses forming part of the conglomerate, and some very thin strings of a coaly matter. The analysis from the above-mentioned Sumas Mountain seam is as follows:—

Analysis of Sumas Mountain Coal.

	Per cent.
Water.....	4.62
Volatiles combustible matter.....	35.68
Fixed carbon.....	42.00
Ash.....	17.70
Total.....	100.00
Coke.....	Fair.

*Transactions of the American Institute of Mining Engineers.

Haase's System of Sinking Through Quicksand.—The management of the Guenin colliery, Cottbus mining district, Germany, while sinking a pump shaft to a depth of 87 feet through quicksand, recently employed the Haase system, the chief feature of which consists in driving down a series of wrought iron tubes, side by side, so as to form a cribbing for the intended shaft. The tubes are 13.1 ft. long, with an internal diameter of 4.1 in. and 0.2 in. thick. Wooden guides with cast iron crossbars at the top and bottom are attached to the timbering of the shaft so as to secure that the tubes take the required direction in their downward course. Six sets of the tubes were used to reach the coal seam. The shaft was 10.8 ft. by 8.5 ft. within the ordinary timbering, and 9.5 by 7.2 ft. within the tubular lining, and required 64 tubes altogether.

Increase of Wealth in the United States.—The rapid increase of the wealth, business and prosperity of the United States, during the past ten years, is simply marvelous. According to the published figures the total wealth of the country is now \$71,459,000,000, equal to nearly \$1,000 per capita. This is an increase in ten years of \$18,000,000,000, or 42 per cent. Great Britain's wealth in 1885 is given at \$50,000,000,000. The average of wealth per head in England is \$1,545; in Scotland \$1,215, in Ireland but \$565. The total wealth of France is estimated at \$36,000,000,000. England exacts in taxes \$20 per head of population, while each individual in the United States pays \$12 50. America will produce 7,000,000,000 tons of iron this year, while England's greatest production is 8,600,000 tons.—*Engineer.*

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