Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- [X] Coloured covers/ Couverture de couleur
- [ ] Covers damaged/ Couverture endommagée
- [ ] Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- [ ] Cover title missing/ Le titre de couverture manque
- [ ] Coloured maps/ Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- [ ] Coloured pages/ Pages de couleur
- [ ] Pages damaged/ Pages endommagées
- [ ] Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- [✓] Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- [ ] Pages detached/ Pages détachées
- [✓] Showthrough/ Transparence
- [ ] Quality of print varies/ Qualité inégale de l'impression
- [✓] Bound with other material/ Relié avec d'autres documents
- [✓] Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- [ ] Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- [ ] Continuous pagination/ Pagination continue
- [ ] Includes index(es)/ Comprend un (des) index

  Title on header taken from:/ Le titre de l'en-tête provient:
- [ ] Title page of issue/ Page de titre de la livraison
- [ ] Caption of issue/ Titre de départ de la livraison
- [ ] Masthead/ Générique (périodiques) de la livraison

- [X] Additional comments:/ Commentaires supplémentaires:

Pagination is as follows: [2], i-xii, 185-196, xiii-xvi, [2]

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X 12X 14X 16X 18X 20X 22X 24X 26X 28X 30X 32X

The Canadian Mining Review

Established 1882

Vol. X—No. 8. 1891—OTTAWA, AUGUST—1891. Vol. X—No. 8.

PROVINCE OF NOVA SCOTIA.

Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

GOLD AND SILVER.

Under the provisions of chap. 7, Revised Statutes of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of six months, which can be extended by renewal for another six months. Mines of ld and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. Up to ten areas the cost is 50 cts. per area, for every area in addition in same application 25 cents. Cost of renewal one half the original fees. Leases of any number of areas are granted for a term of 21 years at $2-00 per area. These leases are fo feitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and in smelted gold valued at $18.00 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to s arch for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which one square mile can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department free of charge, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones; five per cent.; Coal, 7½ cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.

Ontario Mining Laws.

The following is a summary of the chief provisions of the amendments to the Mining Laws of Ontario, passed during the Session of 1891:

1. In Algoma, Thunder Bay, Rainy River and that part of Nipissing north of Lake Nipissing and the French and Mattawa Rivers, the price per acre of mining lands sold after the 4th day of May, 1891, is $4.50 in a surveyed township, and $4 in an unsurveyed territory, if within 12 miles of a railway, and if beyond that limit $3.50 in surveyed and $3 in unsurveyed territory. Elsewhere the price is $3 in a surveyed township any part of which lies within 12 miles of a railway, and $2 if at a greater distance.

2. Instead of by grant in fee simple, mining land may be obtained under a ten years' lease at a per acre rental, unless otherwise fixed by regulation, of $1 for the first year and 25 cents yearly thereafter if north of Lake Nipissing and the French and Mattawa Rivers, or of 60 cents for the first year and 15 cents yearly thereafter, if situated elsewhere, with right of renewal at the expiration for an additional ten years at the same rentals, and with a right of renewal thereafter every twenty years, subject to payment of the yearly rent charge in advance and to such conditions as may be provided by regulation. But the lessee may at any time purchase the land so held, in which case the first year's rent shall be treated as part of the purchase money.

3. The owner or lessee of mining land sold or leased by the Crown after the 4th day of May, 1891, is required during the first seven years to expend in actual mining operations $4 per acre if the location exceeds 160 acres, and $5 per acre if it is 160 acres or less.

4. After the 4th day of May, 1891, all ores or minerals of silver, nickel, or nickel and copper, taken from lands sold or leased by the Crown, are subject to a royalty of 3 per cent., and all other ores or minerals to such royalties as shall from time to time be fixed by Order-in-Council, not exceeding in the case of iron 2 per cent., and as to any other ores or minerals not exceeding 3 per cent.; and such royalties shall be calculated upon the value of the ores at the pit's mouth. But royalties shall not be imposed or collected upon any ores until after seven years from date of the patent or lease, except as to mines known to be rich in nickel, and as to these not until after four years.

5. Hereafter in all lands sold under the Public Lands Act, or for agricultural purposes, all minerals and mining rights are reserved to the Crown, unless otherwise provided in the patent or grant.

6. In the case of mining lands for which bona fide application was made in writing to the Department prior to the 24th April, 1891, grants may be made where the application is received within three months from the 4th day of May, 1891, and otherwise at the price and upon the conditions heretofore applicable in accordance with the terms of section 1, sub-section 5, of the Act of 1891.

ARCHIBALD BLUE,
Director.

OFFICE OF THE BUREAU OF MINES,
Toronto, May 21, 1891.

This advertisement will not be paid for if published without authority.

CANADIAN MINING & MECHANICAL REVIEW

CONDUCTED BY - - - - - - - H. T. A. BELL.

OFFICES:

Victoria Chambers, 140 Wellington Street,

OTTAWA.

Vol. X. AUGUST, 1891. No. 8.

The Prospects for a Possible Extension of the Chracoal Iron Industry in Canada.

Since 1887 the Dominion trade reports have not distinguished, as formerly, the importation of charcoal pig, from other pig iron, nor have they shown the importation of scrap separately from pig, nor is the export of charcoal from the Province of Ontario to be found in their pages. The price of the pig imported from the United States figures in the returns at $18 a ton, that from Great Britain at $11.50 a ton. It has been estimated that the yearly charcoal pig importation from the United States is 10,000 tons, and so far the combined influence of the tariff and the bounty does not appear to have diminished our dependence upon the United States or Great Britain for either charcoal or other pig iron. The following figures leave no room for doubt that the demand for pig iron increases in greater ratio than the home manufacture.

Year ending June 30.	Charcoal Pig. Tons.	Other Pig & Scrap. Tons.	Imported from.	Bounty on Home Manufacture.	Tons Home Manu'fre
1884	1995	9,517	United States.		
	203	65,900	Great Britain.		
1885	1119	7,389	United States.		
		33,594	Great Britain.		
1886..	3185	6,871	United States.		
		34,180	Great Britain.		
1887 .	3919	5,902	United States.		
		38,727	Great Britain.	$59,576	39,717
1888..		12,980	United States.		
		36,440	Great Britain.	33,314	22,209
1889		13,682	United States.		
		60,162	Great Britain.	37,233	24,822
1890 .		23,443	United States.		
		62,697	Great Britain.	25,697	25,697

The bounty from 1st July, 1883, to 30th June, 1889, was $1.50 a ton on all pig iron made in Canada from Canadian ore, from 1st July, 1889, to 30th June, 1892, the bounty is fixed at $1 a ton, and from 1st July, 1892, to 30th June, 1897, at $2 a ton. No doubt the bounty is computed on the short ton which makes it considerably more on the basis of the long ton, by which the iron is sold for consumption. The importations of cast iron pipe amount to 4,000 tons yearly; and for car wheels this country has to give occasional foreign orders. Other castings figure in the imports. Altogether it is safe to say that the country requires at least 100,000 tons a year of pig iron, of which about one-fourth is supplied by the home manufacturer. The estimate is largely within parliamentary statements of course, but that it is respectable at least, appears from the fact that the quantity demanded is ten-thirteenths of the production of Great Britain at the beginning of the century.

How far charcoal pig will meet the ordinary requirements of the founders' trade, the Ontario Mining Commission report may tell us. Mr. Copp, a large foundryman, says: "If we used one third charcoal we could use English and low grade Scotch iron, and turn out a strong nice plate. It seems to me strange that some person has not started the manufacture of charcoal iron in Ontario. If our machine men used more charcoal iron in their castings they would be of a better class, and it would be better for for the country. As soon as it is established that charcoal iron makes better work we will all be willing to pay more for it." Mr. Adam Laidlaw, another extensive iron founder, says. "I think we could use charcoal iron mixed with the Scotch; it would strengthen and improve the castings" H. A. Massey, of the great agricultural implement concern who by the way, have now, agencies in Great Britain, and have there entered the lists against the British manufacturer—says: "I think that at Oshawa they use from 2,000 to 3,000 tons of charcoal iron for malleable castings. If Canadian charcoal iron could be produced for a little more than Scotch or Londonderry, (the prices of which he had given at $18 to $22), no doubt we could use it for nearly every kind of iron we want to make. For machinery castings we want the best iron, and the expense is what has kept us from using charcoal iron. I would take charcoal iron at $24 a ton rather than imported iron at $22. I would consider it to be $4 a ton more valuable. The manufacturers of agricultural implements would use it; and if one used it and made better castings, competition would compel the others to do likewise." Mr. Massey went so far as to recommend a bonus of $2 a ton, "in addition to the present bonus and duty," provided it could be shown that at present prices makers do not get a profit of $6 a ton. Thus the three leading founders in Ontario concur in the view that charcoal pig is a necessity if high class manufacture is required as well for stoves as for malleable castings.

The going charcoal iron concerns, if they have not been invariably financially successful, have at least earned the credit, as one witness stated it, of "making a magnificent quality of car-wheel iron." The demands of this branch of the trade have not been overtaken by Canadian makers within several thousands of tons yearly, variously estimated, from 5,000 to 10,000 tons. Though the adept smelter can make a mixture which will turn out a well-chilled car-wheel from the furnace, thus getting by a direct process, a product worth $40 a ton compared with pig iron at $22, the manufacture of car wheels is generally a special foundry business, in which the character of the work turned out depends in chief upon the mixture of various irons and skill in casting. The demand grows with the requirements of the carrying trade, and bids fair to assume such proportions that it should become a fixed industry, keeping in activity an additional 30 ton furnace. If to this demand is added the requirements of the stove and implement trade, it will be easy to dispose of an additional output of 20 tons daily, thus accounting for the sale of 18,000 tons yearly. But as no furnace, however well managed, gives a uniform product, but rather grades its production into three or more varieties of iron, such as grey, mottled, and white iron, each good of its kind, but having special qualities for the founder or the refiner, so it becomes requisite to consider the possibility of establishing as an adjunct to charcoal iron manufacture either puddling or open-hearth steel furnaces. If phosphorous and sulphur be mentioned as possible difficulties, it may be answered that where the steel-works adjoins the furnace the pig can be sent hot to a cupola carrying a large burden of lime, where with the addition of low phosphorus pig and scrap a dephosphorized iron can be obtained for transfer to the gas furnace. The operation of the Siemens' regenerative furnaces at Bethlehem and Steelton, Penn., with Lima oil and super-heated steam, is now conducted with so much ease in firing and economy of fuel that gas generating for the steel boiler is an almost automatic process, the stoker being entirely dispensed with. Said the superintendent of the Bethlehem Iron Company's steel furnaces to the writer a few weeks ago, "we now do with two men at our fires the work which required 25 men, and get better work done, gaining working space and comfort every way." Mr. Massey, in his evidence before the Ontario Mining Commission, stated that it "is most important something should be done to encourage the manufacture of steel. We import some from England and some from Johnstown, Penn. They supply at Johnstown an article quite as cheap as in England, but of better quality. We have been trying to get the Government to take the duty off cold steel, or to get some one to manufacture it. I think the business in Canada would pay. It would take a very large establishment to supply the requirements of the country in that line of goods. If there is anything that should be encouraged it is the manufacture of steel. Charcoal iron is in the right direction, but steel is the most important." Mr. Massey does not in the least over-rate the importance of encouraging steel manufacture, but in view of the fact that the average duty on manufactured steel is 38 per cent., there surely is no need for further inducement to enter upon the manufacture. If a good home market and a high tariff with a certainty that steel making has a firm hold of the requirements of the people, and that the processes now successfully carried on make the production of soft steel or ingot iron cheaper and more easily managed than the craft of the puddler, if these do not give sufficient encouragement to the enterprise, it is difficult to see what form the encouragement should take.

The plant of a 15 ton Siemens' furnace, including cost of building, was estimated for certain parties in Ontario by competent engineers at $25,000. This estimate contemplated an output of 45 tons of steel blooms and billets per

day, manufactured from imported pig and worn out Bessemer rails. Steel scrap is free of duty. This source, as well as that from the yearly turn-out of old rails from roads west of Montreal would afford a sufficient supply. Instead of importing pig, the better plan would be to erect a 50 ton charcoal furnace, taking from it about 20 tons a day of forge iron for the steel furnace. For the blooms and billets there is an existing demand of about 10,000 tons a year from the wire-rope makers and rolling mills. Structural specifications demand sufficient to justify the erection of a rolling mill for turning out 8,000 tons yearly. Bar iron is being displaced in every direction by good ingot iron or Siemen's steel. Should this branch of work be entered upon, the demand would absorb 16,000 tons a year. A $25,000 Siemen's furnace, driven to its utmost capacity, would turn out 13,500 tons a year, or 40 per cent of the demand. If the manufacture of crucible cast steel, as suggested by Mr. Massey, should be entered upon, a small additional plant for operating with a Darby or some other carbonizing process—even a cementation furnace or two—would probably be a profitable experiment, conducing to wider enterprise.

Any extension of the charcoal iron industry must reckon with American competition. In fact if the importation from the United States, equal to 35 tons a day, could be cut off by the home manufacturer, it would be an augury of new undertakings. The cost of assembling materials at northern coke furnaces, from certain instances quoted in a return by the United States Commissioner of Labor, ranges from $4.04 to $5.92 per ton of iron made, the factors being in the:

	1st Case.		2nd Case.
Ore, freight, 812 miles	$2.174	1,000m.	$4.287
Coal, " 105 "	.067		
Coke, " 132 "	1.578	140 "	1.474
Limestone, freight, 25 miles	.223	25 "	162
	$4.042		$5.923
Total cost of iron	12.508		14.858

The large ratio of freight to cost of production is a feature which should have its significance, when it is considered that Ottawa, Kingston or Toronto are in the neighborhood of supplies of ore, fuel and flux, the charges for bringing which to the furnace should not, at the utmost, exceed one-half of the cost in the first above instance quoted.

Bush Fires and Mining in Quebec.

When a capitalist, usually a foreign one, is induced to invest his money in Canadian mining lands, he naturally considers in his calculations for developing the same not only the mineral but all the resources of the property which are likely to make his investment a profitable one.

If there is sufficient water power on or near his land for driving mining machinery, so much the better. The use of machinery in mines becoming more necessary year after year, the means of operating this, and the working expenses of the same, are a question of the utmost importance.

The use of water power, involving merely the first outlay in plant the working expenses and cost of transmission being comparatively small it is of the greatest advantage to a mine proprietor if he has such a power at his disposal.

At first sight these comparatively gratuitous sources of power seem to exist in wonderful profusion in Quebec, and are, indeed, commented on and held out as an additional inducement by land speculators having mining properties to sell in the Province.

Their availablity is, however, pretty much a delusion, and it is most rare for an investor to find water rights which can be secured for his work, and he usually discovers these to be already secured by speculative monopolists, who do not use them—"who toil not, neither do they spin,"—but who find it more profitable to hold them for further speculation in the future; a system, by the way, inimical to all industrial development, and likely enough in the near future to cause trouble when educational enlightenment shall show that "Vox populi, vox Dei."

Lacking water he must use steam power, and to generate this must have fuel in the shape of coal or wood.

The former is too far away and too expensive for economical use, except in very rare instances in the Province of Quebec—the mines being for the most part in remote and inaccessible regions—and is therefore out of the question for the present.

The latter, however, is quite another thing, and would appear practically available everywhere and inexhaustible in quantity.

Viewed at a distance, the Laurentian mountains seem to be covered with dense forests sufficient to supply the country with timber and fuel for industrial and domestic use for ages to come.

On a closer inspection however this also turns out to be somewhat delusive. For the most part the primeval forest has entirely disappeared, what remains being principally second growth timber and brush. The gigantic pine stumps still standing, and the prostrate and decaying trunks, show how ruthlessly the harvest has been cut and how thriftlessly gathered: how many trees have been felled to rot and waste, and how few culled for use; the second, yet still luxuriant growth of inferior timber, in spite of the absence of all planting, recording at once the grand productiveness of the soil and the reckless waste of those who have cut down but planted not. Recording at the same time the culpable negligence of a government which has impoverished its subjects by licensing a few individual lumber monopolists to enormously enrich themselves out of the natural produce of the land at the expense of the many future tillers of the soil, to whom this timber would have been a source of immediate return, and alone made it profitable to cultivate on economic principles a country which would then not have been deforested.

The wasteful lumber system, and the annual destruction of thousands upon thousands of acres of timber through the fearful and barbarous custom of bush firing, and the absence of any scientific forestry and wooderaft, are rapidly deforesting even this superbly wooded province. And it can be easily foreseen that unless active measures of reform are put in force by the passing of more stringent legislation, in addition to the stricter enforcement of the existing regulations by the rangers, who are too few in number, and whose supervision is of too perfunctory a nature to be efficient, vast districts of the country will be left without timber for building and fencing, and without fuel for burning.

Year after year cordwood is becoming scarcer, dearer, and farther afield. In many mining districts its price has become prohibitory for steam raising purposes, and it may safely be predicted that without water power, or fuel for steam power, many mines will be obliged to close down, or worse still, unable to open at all. Mining labor is dear in Canada compared with that of European countries, with whose markets she has to compete, and where steam fuel is cheap.

To say no more respecting the value of wood, as fuel, to the miner, let us consider its value to him in his work, as timber. In many kinds of deep mining vast quantities of wood are required for timbering and stalling. Buildings for workshops, dressing floors, and machinery, are more than usually necessary in a climate like that of Canada. Many mining companies on account of their isolated situation, away from manufacturing centres, find it necessary to construct their own plant, such as tram cars, waggons, derricks, gins, etc. Their workmen are often from a distance, and dwelling houses for families, boarding houses for single men, and stores for provisions and supplies must be built, and these all necessitate the use of timber, and unless it is on the property or sufficiently near to be cheaply hauled, it is out of the question for mining to be carried on profitably, for the expenses of outfit and maintenance would be too great for the output, ever to recover the first outlay, save perhaps in the mining of precious metals, which are of course an exception to mining generally.

After thus far considering the value of timber and cordwood to the miner, and how important a factor it is in his calculations when purchasing mining property, we will assume that he has made his purchase of land and minerals, paying an increased price for the large quantity of both hard and soft wood growing on his sett.

His method of operation is decided on, his plans made, and with the disappearence of the Canadian winter and the first advent of spring, soon begins to make good progress in the preliminary work of the mine.

Is it possible for a Canadian to imagine the stranger miner's surprise, a little later on, to find the surrounding country a burning mass of fire and smoke, and the farmers and settlers all round for once seriously at work diligently lighting up fresh fires? His own valuable forest in flames; perhaps his already erected buildings destroyed or in immediate prospect of being so; perhaps his wife and children and their home in danger; his expensive staff of miners employing their time in fighting bush fires instead of min-

ing. Perhaps not; but the picture is not overdrawn, and this happens year after year. The property he purchased is in a measure destroyed; he feels there is but slight security for property, and experiences a feeling of distrust in the government. The calculations he made are upset, but a new factor comes into them, and he is able to calculate that in a few years the fuel resources of the country will be burnt out and that mining on economic principles will be no longer possible.

In the Province of Quebec this sort of thing happens every spring, and lasts for a period of nearly two months. In many districts the devastation is already complete, as the forest is all destroyed and there is no more timber to burn, and yet the land remains uncultivated.

It will naturally be thought that in the face of such a state of things, the laws for the prevention and regulation of forest fires are inadequate, but such is not the case. Special provisions have been made by law, and the statutes revised, but with little effect.

It may, however, be taken for granted that these regulations are not made sufficiently public, and though ignorance of the law cannot be pleaded as an excuse for breaking it, still ignorance may be the reason it is broken.

Probably the indifference shown by the Crown Timber Department of Quebec to the complaints constantly laid before it, is at the bottom of the whole trouble.

It is quite certain that if the originators of these fires knew the penalties they run the risk of incurring, the liability incurred by damaging a neighbor's property, the restrictions imposed, and the precautions to be observed, even when the law permits such fires, they would very rarely dare to start a bush fire at all, even for the purpose of legitimate clearing.

Notices of the regulations ought to be posted up at every post office, and on every church door in a township at the commencement of each customary period during which such fires occur. The Forest Rangers employed by the Department should give effect to the regulations by constant and watchful supervision in those districts to which complaints have referred and by cautioning suspected offenders of the penalties they incur.

In conclusion, let not Canada fail to profit by the experience of older countries of Europe, which, after thriftlessly wasting their timber resources for centuries, have now, by the effect of the wise laws of enlightened statesmen and the establishment of forestry schools, set an example to the world, and secured for their descendants the preservation of the woodlands and a moderate but inexhaustible supply of timber of all kinds for commercial and industrial use forever.

Notice.

All communications on business of the General Mining Association should be addressed to Mr. A. W. Stevenson, 17 St. John Street, Montreal, who will act as interim secretary during Mr. Bell's absence.

Extraordinary General Meeting of the General Mining Association.

An extraordinary general meeting of the General Mining Association of the Province of Quebec was held on Wednesday, the 5th inst., at the office of the treasurer, Mr. A. W. Stevenson, 17 St. John street, Montreal. The mining interests of the Province were well represented, among those present being Mr. Wm. White, of Sherbrooke, representing the Eustis Mining Company; Colonel Lacke, of Sherbrooke, representing the Beaver Asbestos Company; Messrs. S. L. Spafford, representing the Nichols Chemical Company; D. A. Brown and Captain Sheridan, representing Bell's Asbestos Company; J. Lainson Wills, general manager of the General Phosphate Corporation; S. P. Franchot, Emerald Mining Company; W. F. Gibbs, Dominion Phosphate Company of London; Captain Williams, Bristol mines; W. H. Jeffrey, Richmond; Irwin, Hopper & Co., Wm. Sclater, O. M. Harris, Dr. Killing, Dickson Anderson, F. Hilton Green, A. Lomer, Theo. Doucet and Geo. Stewart.

The chair was taken by Mr. S. P. Franchot, who briefly stated the object of the meeting, which was to take into consideration the proposed application by the Provincial Government of the mining law passed last session, the Government having sent out to the various mine owners schedules to be filled in and returned, giving particulars as to output, shipping point, destination, etc.

After a long discussion in which most of the members took part, the following resolutions were passed:—

Moved by Mr. W. H. Irvine, seconded by Mr. W. H. Jeffrey, "That inasmuch as a petition has been presented to the Governor-General in Council praying for the disallowance of the Quebec Mining Act, passed at last Session, it is deemed advisable and hereby resolved, that pending a decision upon the said petition, the members of this Association be and are hereby requested to refrain from completing and returning to the Crown Land Department of the Province of Quebec, the affidavit and quarterly report recently issued by said Department, and that a copy of this resolution be forwarded to each member of the Association."

Moved by Mr. A. W. Stevenson, seconded by Mr. O. M. Harris, "That all matters arising out of the enforcement of the mining tax or royalty referred to in the preceding resolution, be left in the hands of the Council of the Association."

The meeting then adjourned.

The Mineral Resources of Hudson Bay.

The Winnipeg and Hudson Bay Railway Bill has just received its third reading in the Senate. The general character of the country through which the road will run is not familiar to Canadians, and the following letter of Dr. Robert Bell to the Minister of the Interior may interest our readers:—

"GEOLOGICAL SURVEY,
"21st July, 1891.

"HON. EDGAR DEWDNEY, M.P.,
"Minister of the Interior,

"SIR,—In connection with the discussion of the Hudson Bay Railway, the following notes, on the resources of the country, near the proposed line, may be of interest.

"First, in regard to economic minerals. On the line, as projected between Lake Winnipeg and Manitoba, extensive deposits of gypsum occur, immediately under the surface of the ground, over a considerable area of the north-west of Lake St. Martin. The mineral is easily recognized, and the Indians report having found it also further to the north, as we might have expected from the known geological structure. The value of this substance as a manure can hardly be over-estimated, and there is no other known source to compete with this locality for the supply of Manitoba and the north-western States. If these deposits are made available by the construction of a railway, there would also be a large demand for the mineral for other purposes.

"Next, I would mention the brine springs near the northern and southern extremities of Lake Winnipegoosis, at both of which localities excellent salt was manufactured before the railways had reached Manitoba. The rocks at these localities are of the same geological age as those from which salt is derived on the eastern side of Lake Huron, and there is every reason to believe that abundance of strong and pure brine could be obtained by boring at the former, and that all the salt required in the North-West might be made here, thus saving the long transportation from the east.

"The discovery of amber at Cedar Lake promises to be of importance, and the local industries connected with the utilization of this substance may hereafter support a considerable population, as is the case in East Prussia. This unexpected discovery is an instance showing the great possibilities which that vast region possesses in the way of mineral resources.

"A specimen of quartz brought from Pelican Narrows, further to the northward, by an assistant of mine in 1881, was assayed in the laboratory of the Geological Survey, and found to contain a small quantity of gold.

"A promising deposit of hematite ore occurs on Black Island, in Lake Winnipeg. This iron ore might be smelted in the vicinity of Grand Rapids, at the mouth of the Saskatchewan, by bringing coal from the west to meet it there. A railway to that point would give a great impetus to such an enterprise.

"The fall at Grand Rapids amounts to about 100 feet, thus affording an almost unlimited water power. In a vast region where important water powers are so scarce as they are in Manitoba and the North-West Territories this fact has great significance when we consider the future requirements of that great country.

"I have made a survey of the Nelson River, all the way from Lake Winnipeg to Hudson Bay, as well as of the boat route from Norway House, by way of Oxford Lake and Hayes River to York Factory, and also of the Little Churchill River and the Great Churchill, from the junction of the latter all the way to the sea, and I am therefore in a position to speak with confidence of the country through which these rivers flow. The total fall from Lake Winnipeg to the sea amounts to 710 feet, or an average of about a foot and a-half to the mile. The general aspect of the country on either side of the Nelson River is level, with banks of clay on either side, as illustrated by numerous photographs which I took all along. There are points or rock, of course, where the falls or rapids occur, but the proportion of rock to soil is comparatively small.

"Excellent wheat is grown at Norway House on the right bank of the river, 27 miles below Lake Winnipeg, where, I believe, it is a sure crop every year, and also at Cross Lake, more than 50 miles down the river. Some years ago I sent a variety of vegetable seeds to be sown for experiment in the Indian gardens at Cross Lake, and the results were extremely favorable—at one time a considerable quantity of barley was grown at Oxford House.

"I attribute the fine summer climate of that region to its comparatively slight elevation above the sea, and to the prevailing south-westerly winds, carrying the heat of air from the surface of the warm waters of the Lakes of Winnipeg Basin over a broad belt of country of the north-eastward.

"Yours faithfully,
"ROBERT BELL."

An Interesting Plant.

There has recently been set in operation at the Kensal Green Gas Works of the London Gas Light and Coke Company, a most interesting plant, which automatically takes eighty tons of coal per hour from the barges on the adjacent canal and passes them direct part to 500 retorts and the other part to thirty-eight stores. For nine hours each day the plant carries out the work satisfactorily with only slight supervision. On the wharf are two crane elevators moving on wheels, and fitted with ordinary grab buckets, which raise the coal from the barges and drop it on to a hopper formed of large screens placed at an easy angle and ending at the lower end or apex in a shoot. The larger pieces of coal, forming 10 per cent. of the total, which do not go through the sieves of the screen, pass through the shoot to a coal breaker, and from thence by gravitation to what is called a "conveyor." The small pieces which go through the screen also gravitate to the conveyor. The eighty tons of coal, made into convenient sizes for use, are taken along an underground passage, thirty-five feet long, by this mechanical conveyor. If the reader can recall the appearance of a leather belt moving in a horizontal plane, and winding round two large pulley wheels placed about thirty-five feet apart, he will be able to understand the mechanism. The belt, however, instead of being of leather, is made up of a number of flat steel square trays placed closely together, and attached in the centre at the back to an endless chain, winding round and moved by the pulley wheels. As each successive steel tray passes round the pulley some coal passing through the shoot drops on to the top, and it continues to move forward till the other pulley is reached. As it winds round the wheel the coal is dropped down a slight incline. The coal in each successive tray is caught in this incline in one of a number of buckets attached to a chain working in a vertical plane around two wheels, one at top and the other at bottom, and in this way the mineral is raised to a height above the level of the retorts in which it is to be used. The buckets work in the same way as in a dredger. At the top the material is thrown into a hopper so constructed that it passes thirty tons per hour into a conveyor, which distributes the coal along a double setting of retorts extending 400 feet in length and containing 500 retorts; while the remaining 50 tons per hour is distributed into thirty-eight stores for the night supply or reserve stock. These stores are on each side of the retort house, and the fifty tons of coal pass from the hopper down two shoots, one on each side. The arrangement of this conveyor is different from the others, as it was necessary to so adopt it that it could deposit coal at almost any point. Each conveyor is about 370 feet long, and may drop coal in the stores underneath at intervals of from twenty to thirty feet. A channel, which may be likened to the gutter alongside the curb, is formed above the stores, and at either end there are wheels round which revolve chain gearing, attached to which at short intervals are plates of T iron, and as the chains revolve the sharp edges of these pass along the channel pushing the coals forward. The coal falls into the channel at one end, and each successive plate draws along its own quantity. In the channel there are trap doors at intervals, so that the material may be allowed to drop at any point. There may be many adaptations of conveyors. For the night service the coal is drawn from the coal stores into two conveyors, each 400 feet long, fixed underneath. These deliver it into the elevators, which in turn supply the tilting scoops at the retorts. All the conveyors and elevators are worked by the interposition of belting. The plant is said to be the most extensive conveying plant in the world.

A few Practical Notes on Pumping.*

By William Archibald.

At a meeting of the Institute held in Edinburgh on the 31st of January last, Mr. John Durie suggested that the Council should make an independent and exhaustive inquiry as to the relative efficiency of different kinds of pumping engines. It is not with the view of supplying Mr. Durie with that information that this short paper has been written, but he has touched upon a subject of great breadth, and one there is ample scope for the members of the Institute to work upon. Valuable and thoughtful papers have been contributed by Mr. M'Creath, Mr. Baird, Mr. Andrews, Mr. Landale and Mr. Moore, but there yet remains a large field untouched. Mr. Durie's suggestion would be all the more valuable and productive of practical results, if a number of consecutive papers were read, descriptive of the various kinds of pumps and pumping engines that are working at our respective collieries. There is abundant material to work upon, although one were only to describe the various kinds of special steam and hydraulic pumps that are at work. If each member would contribute to the Institute his experience, be it ever so little, of pumps, pumping engines, and the class of pump rods used, etc., or even *if he were only to describe* plainly the class of pump or pumps under his charge, without going into technical or theoretical details, a mass of very desirable information would be added to our *Transactions*, and be of inestimable value to those about to fit up new winnings. It is sometimes a very ticklish point indeed to decide what kind of pump will be the best to fit up under certain conditions. Suppose one decide on fitting up pumps of a fairly large description, it is generally too expensive an operation, and not always expedient to discard one class of pump for a different, or perhaps a better class, even assuming a mistake has been made in arriving at the first decision. My experience has been mostly confined to large, or rather heavy fittings, but I have nothing new or original to set forth in this paper, but merely wish to describe a direct acting pumping engine and pump, erected at No. 10 pit, Haywood, belonging to the Haywood Gas Coal Company. The engine was made by Messrs. Turnbull, Grant & Co., Canal Basin, Glasgow, and was erected in 1873. Plate II., shows the side elevation. The steam cylinder, which is 84 inches in diameter, is placed directly over one end of the pit, and has a stroke of 12 feet. The beam over the engine is made of malleable iron plates, ¾ inch thick, and is 21 feet long, over all, with cast iron distance pieces riveted to the sides. One end of the beam is attached to the piston rod, the other end slides, in cast iron guides, with ordinary slide blocks, resting on two strong wood beams built into the walls of the engine house. The vertical motion of the piston rod is maintained by means of two motion rods, fitted on each side of the beam nearest the piston.

It will be observed that the piston rod connecting the beam with the cylinder is very small, compared with the other dimensions of the engine, being only 4½ inches in diameter. *The only work this* piston rod and beam have to do is simply to lift and lower the tappet or plug rod for opening and shutting the steam and exhaust valves, and to work the condenser pump. The steam acts only on the under side of the piston, and after doing duty in lifting the pump rods, is exhausted into the condenser, which is connected with the top of the cylinder, and the downward motion of the pump rods is retarded. Of course the steam in the cylinder can be throttled in its passage to the condenser, thus also preventing the pump rods descending too rapidly. The weight of the pump rods in forcing sets is generally in excess of what is required for forcing the water.

To illustrate Mr. William Archibald's paper on PUMPING.

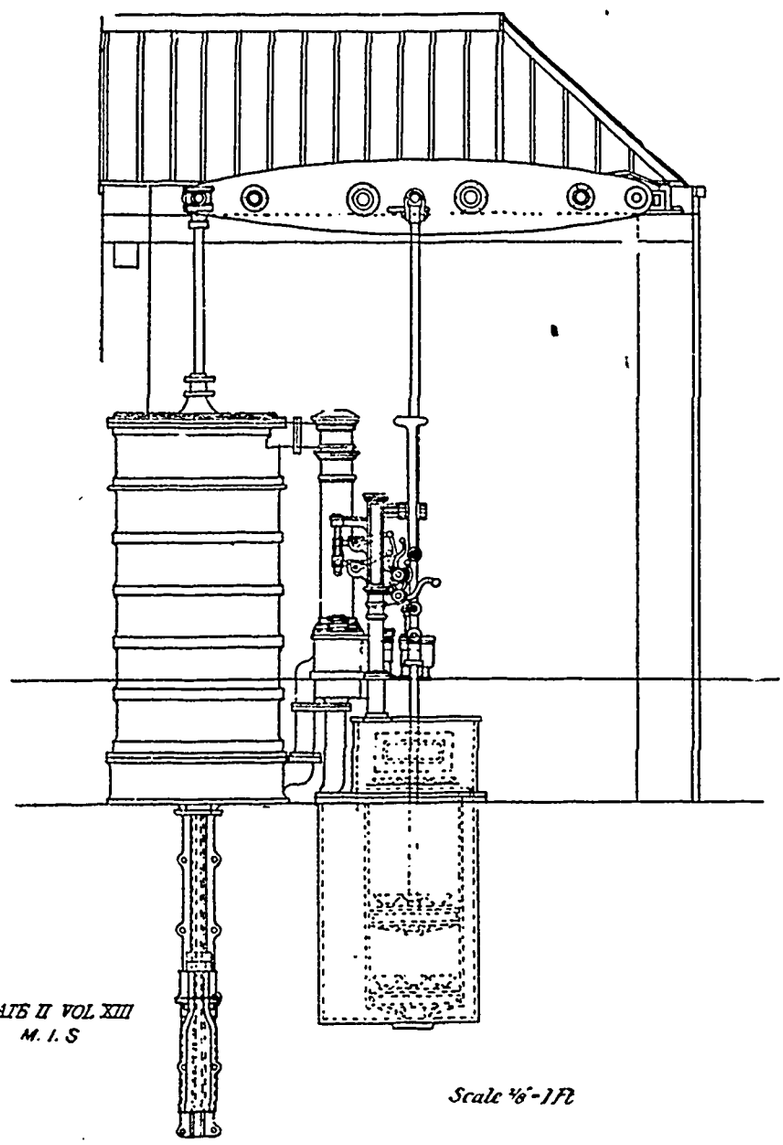


PLATE II VOL XIII
M. I. S

Scale ⅛"-1Ft

CONDENSER.

The condenser pump, (plate III.), which is worked from the beam by the tappet rod, also the top and bottom valve seats, are fitted with disc rubber valves about 16 inches in diame by 1 inch thick. There are 18 of these rubber valves connected with the condenser and pump; each valve is held in its position by cast iron saucer-shaped guards, bolted to the valve seats by 1¾ in. bolts. It is very essential in engines of this type that these rubber valves be made of the very best material that can be got. If worthless valves are put in, the vacuum is affected and valuable time lost in renewing them that often cannot well be spared when the growth of water is heavy, requiring the engine to work night and day all the year round. I have seen good rubber valves stand from one to two years, the engine going steadily from 2½ to 3 strokes per minute; and others not lasting one half of that time. The pit water, which is corrosive, sometimes eats through the top and bottom valve seats of the condenser, but of course the extent of this altogether depends upon the nature of the water supplied to the condenser. The pit water was used for our condenser, and only one of these valve seats—the bottom one—had to be taken out, after having been at work for fully 14 years. It was specially arranged once a year, about the month of August, when the growth of water was light, to stop the engine from 14 to 16 hours to draw the condenser pump, examine and renew (if need be) the valves, and clean the valve seat gratings, which got choked up with a heavy sediment that was in the water. The vacuum was always at its best, and the engine generally worked more smoothly after these periodical examinations.

ELEVATION.

The end elevation of the engine (plate IV.), shows the m a piston rod, 9½ inches in diameter, which passes down through the bottom of the cylinder, and catches the pump rods at a cross head which works in ordinary cast iron slides near the top of the shaft. This cross-head and the top ram is connected by two sets of parallel pump rods 18 inches apart. These parallel rods (plate V.), are in various lengths, from 24 to 32 feet each, are pitch pine, 12 inches square, and double plated with iron plates at each joint, each set of plates being respectively 12 and 11 *feet long, 9 inches broad, and 1 inch thick. There are* 30 bolts 1⅛ inches square at each joint, 16 bolts in one pair of plates, and 14 in the other. Between these pump rods are round iron bars nailed to the rods, about two feet apart. These are put on as a step for the purpose of travelling up the pump rods. The pump was stopped an hour or two every week for the purpose of having an examination made of the pump, rods, plates, bolts, etc., from the ram to the surface. Beyond screwing up a loose nut here and there, no trouble was experienced with these rods from one end of the year to the other. With good strong fittings well put together to begin with, it is surprising the small amount of tear and wear in rods of this description, and the trifling expense required for their maintenance when we consider that they send to the surface fully 300 tons of water per hour, and over two and a half million tons per year. During the six years these pump rods were under my charge, no plate or rod broke in this set of rods, and I am not aware that a single rod or plate has been broken since they started to pump 18 years ago.

THE RAM

is of the ordinary description, 32 inches in diameter with a 12 ft. stroke; and, considering the work it has done, it is in first class condition. It was packed with the ordinary white rope, pleated about 2 or 2½ inches square, well steeped in tallow, along with two or three turns of common patent packing at the top. The ram had to be packed every six months. Considering the good condition of the ram, I had always a notion that we used more packing than was required, but attributed that to the contracted area of the

RISING MAIN

putting more pressure on the packing than it otherwise would have done if the rising main had been equal in area to the ram. The rising main is made up of two columns of pipes (plate V.) above the air vessel, 15 and 20 in. each in diameter, the respective areas of which combined is not much more than half that of the ram. These two columns that form the rising main were lying on the ground not in use before this set of pumps were put in, and, consequently, were utilized for the purpose described, otherwise they would never have been where they are.

THE AIR VESSEL,—(Plate VI.)

has a capacity of 27 cubic feet, the capacity of the ram being 67 cubic feet, or nearly 2½ times that of the air vessel. Although the capacity of the air vessel is small compared with the ram, I am not aware that the engine or pump rods ever suffered from shocks due to air in the rising main, because the velocity of the water never exceeded 45 feet, and generally not much more than 30 feet per minute. There was also a 2 in. pipe from the discharge clack door for the purpose of running back water into the lodgment, to keep the ram on solid water. This back water pipe was frequently used, and consequently, relieved the rising main of any air that would have collected. The valve of this pipe was opened and shut by the engineman. A wire from a float in the lodgment was led into the engine house which showed the condition of the lodgment, and the valve was regulated accordingly. The ram casing, clack pieces, and rising main rested on three strong cast iron girders, 12 feet long, 2 feet 6 inches deep, and 6 inches broad.

CLACKS.

The suction and discharge clacks (plate VII.) of this forcing set are of the ordinary flap type, about 3 *feet in diameter mounted with three* plies of leather, with plates riveted top and bottom in the usual way. The clack seats had bars cast across their diameters for the purpose of strengthening the clacks, and had an angle of 20° for the lids to work upon. The following are the dates when the clacks were changed, and the number of days each clack worked for ten years.

SUCTION CLACK—FORCING SET.

Year.	Month.	Days Worked.
1876	October 28th	...
1877	October 11th	348
1878	September 28th	352
1879	August 23rd	329
1880	September 18th	391
1881	December 11th	449
1882	*July 3rd*	204
1883	April 2nd	273
1884	January 14th	287
1885	...	...
1886	March 29th	804
Average		381

* Trans. Mining Inst. of Scotland.

DISCHARGE CLACK—FORCING SET.

Year.	Month.	Days Worked.
1876	November 11th	...
1877	October 13th	336
1878	March 17th	155
1879	April 7th	386
1880	July 19th	468
1881	December 12th	511
1882	...	...
1883	April 14th	488
1884	August 30th	503
1885	...	...
1886	March 29th	576
Average		427

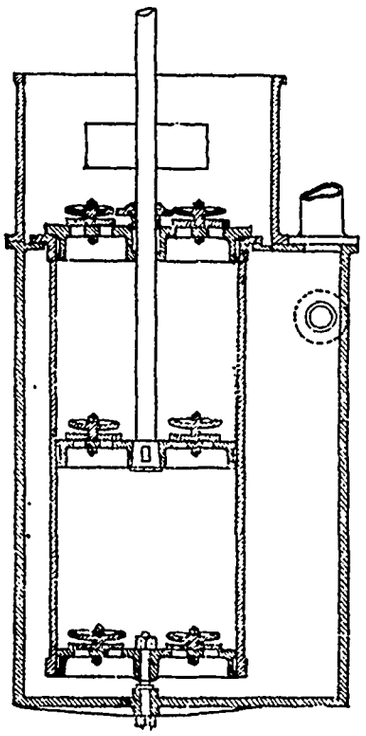
changed, and the number of days each bucket worked for ten years: —

Year.	Month.	Days Worked.
1876	June 10th	...
1877	March 29th	292
1877	May 5th	37
1878	May 4th	364
1878	November 16th	196
1879	...	...
1880	May 4th	534
1880	July 5th	72
1881	June 25th	345
1882	July 4th	374
1883	...	...
1884	January 12th	557
1885	...	...
1886	June 26th	895
Average		366

1878	September 7th	133
1879	August 2nd	329
1880	July 3rd	335
1881	September 24th	448
1882	December 2nd	434
1883	...	...
1884	January 19th	413
1884	September 28th	252
1885	...	...
1886	October 2nd	734
Average		341

The pressure on the 30 in. bucket was about 40, and on the 24 in. only 26 pounds per square inch. Still the life of the 30 in. bucket was greater than the 24 in. one, although it had much more work to perform every stroke. Why one bucket in the 30 in. set should do eight times the work of another, all things being equal, is a question that would not be easily answered. In fact, I do not know that any tangible reason can be given for the difference in the amount of work performed by each bucket.

To illustrate Mr. William Archibald's paper on PUMPING.



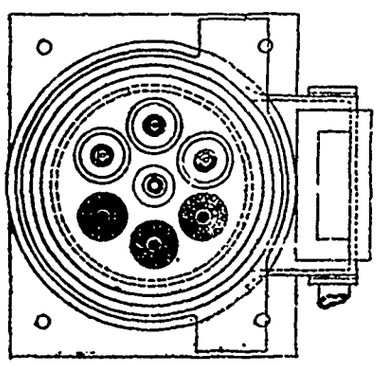


PLATE III. VOL XIII
M. I S.

Scale ¾"-1Ft.

To illustrate Mr. William Archibald's paper on PUMPING

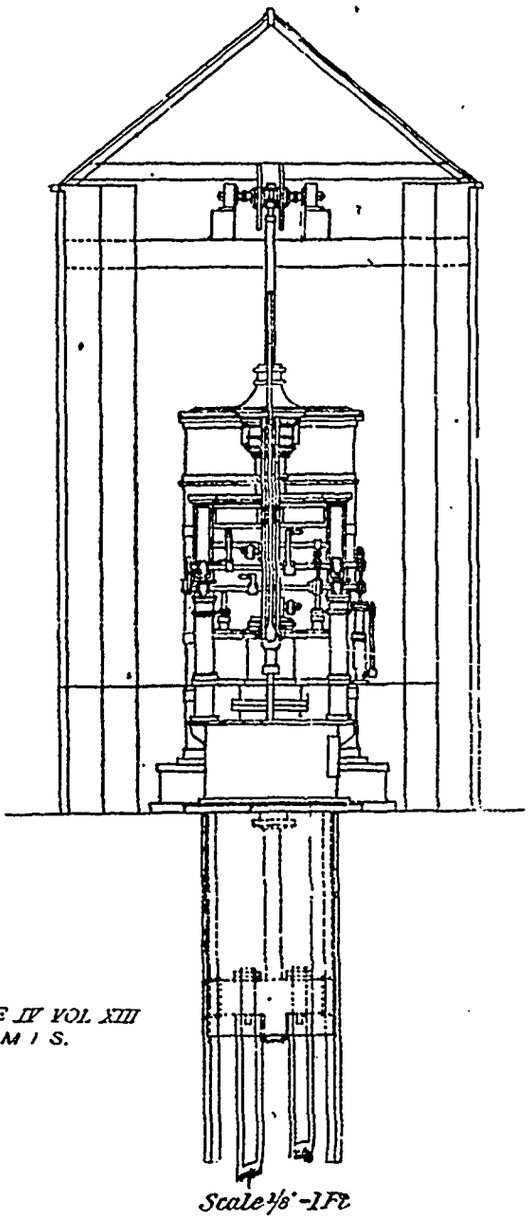


PLATE IV VOL XIII
M I S.

Scale ⅛"-1Ft.

In ten years there were nine suction and eight discharge clacks put in, the average days worked being 381 and 427 respectively.

BUCKET LIFTS.

From the surface to the top lodgment was fifty, from the top to the mid lodgment fifteen, and from the mid lodgment to the bottom ten fathoms—total depth seventy-five fathoms. There are two bucket lifts under the ram, and the shaft being only 5 feet 6 inches wide, left no space for wood rods to pass the clack pieces of the forcing set, down to the bucket lifts, consequently iron rods 5½ inches by 3½ inches had to be put in from the apron past the top lodgment, where they catch the wood rods from the lower lifts. The first bucket lift, as stated, is fifteen fathoms. The diameter of bucket is 30 inches, the rods of which are from 30 to 32 feet long each, pitch pine, 12 inches by 10 inches, and double plated with iron plates, 12 feet long, 9 inches broad, and 1 inch thick, and 30 bolts 1⅛ inches square at each joint, similar to the forcing set. The bucket was mounted with gutta percha, the lids being of leather, lying also at an angle of 20° as the clack lids.

30 IN. BUCKET.

The following are the dates when the 30 in. bucket was

The second bucket lift under the ram is ten fathoms: diameter of bucket 24 inches. The rods are also pitch pine, from 24 to 32 feet long each, with two iron plates at each joint, 10½ feet long, by 7 inches broad, and ¾ inch thick with twelve bolts 1 inch square.

24 IN. BUCKET.

The following are the dates when the 24 in. bucket was changed, and the number of days each bucket worked for ten years: —

Year.	Month.	Days Worked.
1876	June 10th	...
1877	February 27th	257
1877	September 8th	198
1878	April 27th	231

All the buckets for the ten years given were mounted by the same person, and the best quality of gutta percha was always bought and the highest price paid. Still there is not the least doubt that their life was often shortened by adulterated and inferior stuff. The average life of the lower bucket was less than the top one, but that was, I believe, in a great measure due to frequent cleaning of the lodgment. The stirring up of the mud and gritty matter while the lodgment was being cleaned, no doubt helped to destroy the lower bucket. The 30 in. bucket got practically no water but what the 24 in. one delivered to it. The working barrels in both sets were in good condition.

BUCKET CLACKS.

The following are the dates when the 30 inch bucket clack was changed and the number of days each clack worked for ten years: —

Year.	Month.	Days Worked.
1877	January 12th	...
1877	May 5th	113

Year	Month.	Days Worked.
1878	July 20th	417
1879	November 26th	488
1880		
1881	January 21st	421
1882	July 8th	533
1883		
1884	January 15th	558
1885		
1886	January 23rd	730
Average		466

24 IN. BUCKET CLACK.

1877	February 22nd	
1877	October 13th	233
1878	March 23rd	261
1879	February 8th	322
1880	February 3rd	360
1881	May 31st	485
1882	July 8th	403
1883		
1884	January 18th	559
1885	January 17th	364
1886	May 25th	493
Average		355

While the average life of the 30 in. and 24 in. buckets were 366 and 341 days respectively, in ten years, or twenty five days in favour of each 30 in. bucket, there is still a greater difference in the life of the clacks. Seven of the 30 in. one were put in, and nine of the 24 in. one in ten years, the average days worked being 466 and 386, or 80 days in favour of each 30 in. clack. The 30 in. clack had certainly a greater pressure to sustain than the 24 in. one; but undoubtedly, if the cleaning of the lodgment told against the life of the lower bucket, it must also have done so in the case of the lower clack.

Five or six pits were working, and in each pit dooks were driven to the dip off the pit bottom. Three or four of these dooks had bucket pumps from 16 inches in diameter and upwards goit g night and day. These dook pumps were driven by the shaft pump rods with cast iron cranks in the pit bottom. These cranks had to be restricted in their size for getting them down the shafts, 5 feet 6 inches being the widest. The arms of these cast iron cranks were naturally short, and consequently put a considerable radius on the shaft rods when the stroke was long.

The tear and wear on the crank seats and plummer blocks was very great, due to the short leverage, and it was decided to put in malleable cranks. These cranks (plate VIII.) were made by Messrs. Kesson & Campbell from a design of my own, and were a considerable improvement and saving compared with the cast iron ones. There was practically no restriction as to their size.

They could be easily fitted up and taken to pieces, and were light and strong. One of these cast iron cranks worked for some years the dook pump on the forcing

To illustrate Mr. William Archibald's paper on PUMPING.

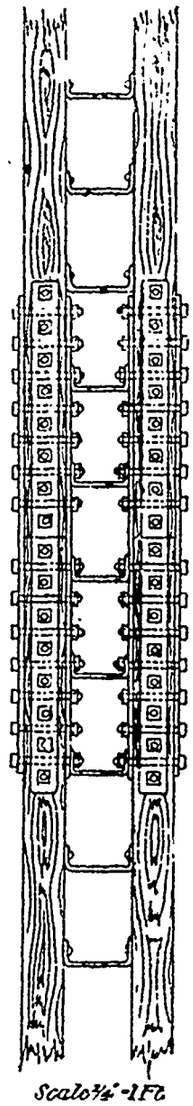
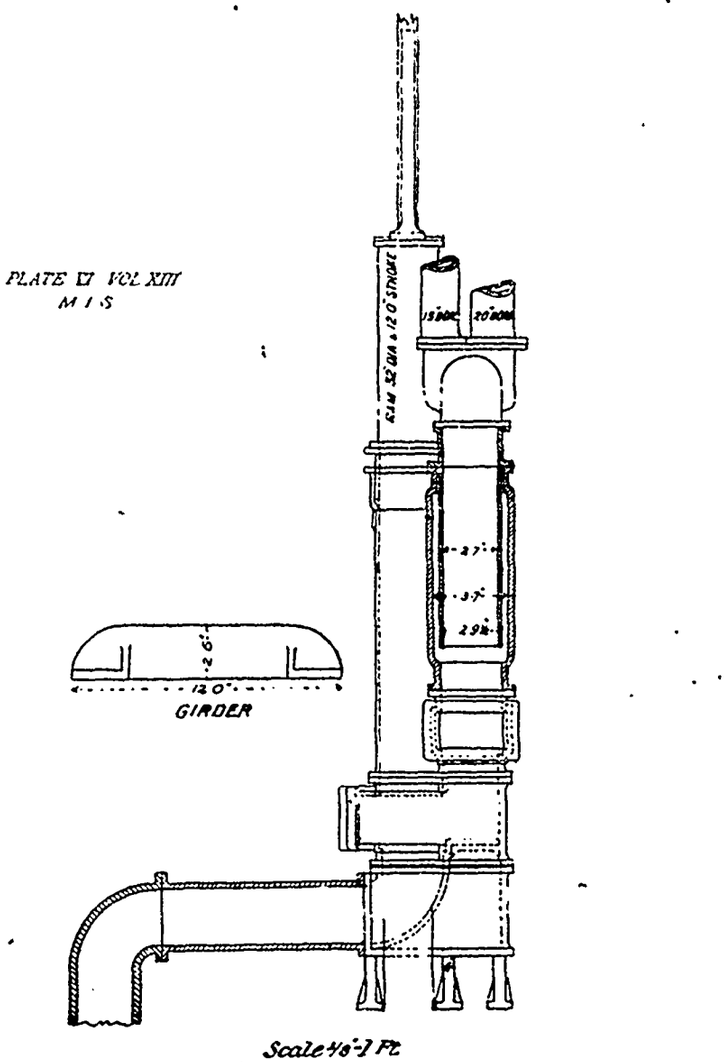


PLATE V VOL XIII
M I S

Scale ¾"-1 Ft.

To illustrate Mr. William Archibald's paper on PUMPING.



Scale ⅜"-1 Ft.

principle, that is, the shaft bucket was on its down stroke when the dook bucket was on its up stroke. This system periodically gave trouble, and all the other cranks were fitted up to work on tension, which was found to be the safest and most economical method.

It may also be stated that there was another direct acting pumping engine in No. 4 pit, made by Mr. Barclay, Kilmarnock. The diameter of the cylinder was 55 inches, stroke 10 feet, and diameter of the ram 22 inches. This engine and shaft fittings were also a good substantial fit up, and the pump has been pumping constantly night and day for over twenty years with good results.

In closing these notes I regret to say that I cannot state the amount of coal consumed for a given quantity of water pumped. There were so many engines all getting steam through the same pipes, that it was difficult to apportion to each its share of the coal consumed, and I am not aware of any diagrams being taken off this engine since it was erected in 1873. Diagrams should be taken off our winding, haulage, and pumping engines periodically. They are all the more necessary with engines of this description where there is a heavy weight of pumping rods, etc., to lift and lower at each stroke. The insuring of our steam boilers and their periodical inspection by competent officials specially trained for that purpose, has been productive of good results, both as to safety and economizing of fuel. Similar arrangements might be made for taking diagrams off our engines to keep us posted up as to their condition. Diagrams properly taken off would at once show under what conditions the engine is working, and the weight of the pump rods could be more nicely adjusted to the work required. I have not the least doubt that in a large number of our heavy fittings, where forcing rams and engines of this description are used, we are lifting and lowering at every stroke weights far in excess of what is required to force the water to the surface, thereby wasting more coal than is needed, and subjecting our machinery to greater tear and wear than is necessary.

The Effect of Safety Lamps upon Eyesight.

It would appear from investigations made by a British scientist that safety lamps have a most injurious effect upon the eyesight of miners, being the chief if not the sole cause of nystagmus, night blindness and photophobia. The great trouble arises from the nature of the shadow cast by the safety lamp, and it would seem that the great acme of perfection in a mine light is a light of greater effulgence and less shadow than that of the present lamps. So prevalent is blindness of various natures amongst miners who habitually use the safety lamp that considerable attention is now being paid to the matter, and the present investigations are therefore of considerable value. They were carried out in the Derbyshire collieries, a number of men working with mine and a number working with safety lamps being examined. It was found that out of 524 persons using safety lamps, there were 164 afflicted with nystagmus (which consists of a peculiar oscillation of the eyeballs), 127 had night-blindness and 61 photophobia. This clearly proves, Dr. Court states, that there is a serious amount of disease, and is in striking contrast with the disease found among the 573 miners using naked lights, of whom only 32 had nystagmus, one had photophobia and 12 night-blindness. This difference is made greater still when it is borne in mind that, out of these 32 cases of nystagmus, 29 of the men had previously used safety lamps, and the one man with photophobia and 11 of the cases of night-blindness had also been employed in mines worked with safety lamps. In other words, of the 544 men who had always used naked lights, there were only three who had nystagmus, and they worked with candles.

The Ventilation of Mines.

A novel problem has been suggested by Mr. P. P. Quackenboss, a chemist of long standing, in a letter to an American contemporary, which has an important bearing upon the safe and more efficient working of mines, and particularly as regards their ventilation.

Mr. Quackenboss states that in view of the development of electricity in mining operations, it becomes necessary to provide a larger factor of safety in future methods than is at present possessed. He is of opinion that with all the precautions that engineering science has provided for mines, it is only by constant vigilance that destruction is avoided.

The first and most important subject is firedamp (CH_4), owing to instant effects, and the second is chokedamp (CO_2), which, though slower in its action, is equally delerious. These gases are not confined to one spot, but by falls of roof in gangway or drift, or by miners' blasts in the rooms, they are liable to appear at any time and in all parts of the mines. Air-splits and brattices and all the known methods of controlling these gases fail at the critical moment. Mr. Quackenboss thinks, however, that if a more determined effort were made by those in authority to comprehend the nature of these gases, and to control their effects, the condition of mining property might be improved, the safety of the miners increased, and the profits largely augmented. It is for these reasons that the writer of the letter presents the following facts for the consideration of mining engineers:—

My first thought was that forcing hundreds of thousands of cubic feet of air into an air shaft to eliminate a few hundreds of feet of gas was a waste of power. Then again, it was being constantly polluted by mephitic gases during its journey through a mine from the natural exudation of "blowers" and "blasting." Then carburetted hydrogen as it makes its first appearance in a mine is a dry gas and is expansive and inflammable, but if it finds an excess of hydrogen present it becomes a saturated gas and explosive. Thus density and humidity add hydrogen in a finely sub-divided state, and it only needs a little agitation of the air and gas to prepare a big or little pyrotechnic display. The experiments shown by Thos. Shaw, M.E., with his celebrated inspector's mine gas testing machine have been of the greatest use to the miners and operators of to-day in demonstrating sub-divisions of gases, and in the hands of state inspectors will prove invaluable in the future. But of what use is it to know of dangers if they are not avoided in consequence of that knowledge? Therefore, if knowing the nature of CH_4 we see another element of danger about to be added to it, we need not wait for the damage to occur. The ordinary condition of a mine did not seem to present to my mind the excess of hydrogen spoken of above, so I sought for it in the air forced into the mine by the fan at the mouth; then I saw at once that barometric change would produce the result if other conditions were right, and so taking a list of mine explosions to Serjeant Dunn, the signal service officer, at New York, and explaining my theory we took the record of temperature issued by the War Department, and selecting four cases, as follows, were surprised at the record:

January 23, 1889, at Wilkes-Barre, explosion of mine gas. At that time the report shows a high pressure just passing off and a low pressure just approaching from the W.S.W.; barometer, 30.10. April 15, 1889, at Wilkes-Barre, explosion and precisely the same conditions. January 18, 1890, at Avondale, exactly the same conditions and result. June, 1890, the Hill Farm explosion at Dunbar, exactly the same conditions and result. We then started again with a list commencing with an explosion at Rich Hill, Mo., March 23, 1888, and again the high pressure was receding and low pressure approaching; barometer, 30.10 to 30.20. In all the cases from then down to January 1, 1891, the conditions are identical, and in each and every case the humidity was increasing so as to be marked plus. There we have the necessary conditions to create an explosion added to by a fan blower forcing a dense humid air down a mine like a gunner ramming home a charge in a gun. There is the death knell to the present system of ventilation, and the engineers will be forced to reverse their fans, and exhaust from their mines instead of forcing air in. Another point I wish to suggest is that as gas is lighter than ordinary air, it rises to the roof, and pipes of proper size and material would draw out the gas first. If proper openings and short pipes were put at suitable distances, with the necessary slides for closing those not in active use, the mine boss could start into a mine, and by opening and closing these vents would be able to eliminate all the gases collected in the galleries, air shafts or drifts before the men came in, and if falls of roof occurred during the night, damaging the pipe, it would not be very expensive to replace it on my plan. If this shall be carried out, I am led to believe that we can introduce the electric current into our mines with almost perfect safety.

The suggestion made by Mr. Quackenboss for minimising or obviating the explosions would imply a radical change in the present practice of mine ventilation. The idea that the forcing of dense humid air into the mines under certain atmospheric conditions, may add the element of hydrogen necessary to bring about an explosion is of great interest, and is borne out by the proofs brought forward in the letter.

Elimination of Manganese from Cast Steel.*

By M. L. Campredon, Metallurgical Chemist.

Manganese is a metal of relatively recent discovery. Scheele met with it in 1775 in certain manganesiferous ores, and Gahn separated it a few years later. In 1820, metallurgists found it in some varieties of pig. Berzélius, Karsten and Berthier were the first to study the combination of iron and manganese. We have to come down to 1862, the date of the truly practical application of the Bessemer process, to find a judicious and rational employment of manganese in metallurgical operations. Some years later, in studying the manufacture of steel in the Martin furnace with argillaceous sole, M. Vallon was led to present a theory of recarburation, and of the action of the manganese over the oxides of iron, which always contain the metal towards the close of the operation. Before the researches of M. Vallon, the quantity of manganese contained by specular pigs was not settled by chemical analysis, and according to the very happy expression of an eminent metallurgist, these products were bought by industrials according to their "good looks," and especially according to the dimensions of the facets presented by the pig. Manganese is now the most valuable auxiliary of the steel manufacturer in the best and most recent methods converters and furnaces with acid, neutral or basic sole. Spiegel and ferro-manganese have become common and well-known re-agents.

Oxidation of Manganese.—In a general way, manganese is eliminated by preliminary oxidation. Manganese has always been considered as a very oxidisable element capable even of reducing other oxides, such as oxides of iron, by seizing upon their oxygen while the iron is set free. Metallurgists who formerly practised and studied the refining of manganesiferous pig never suspected that a certain proportion of manganese could remain in the steel or iron produced. Certain kinds of white pig, especially that from Luxembourg and Westphalia, were, however, held in repute for the production of steel. Was it because the manganese of these pigs prevented the oxidation of the carbon, or was it rather because manganese remained in the products obtained, that these pigs furnished steel with facility? An analysis of the steel obtained in this way would alone enable us to reply to this interrogation. In the puddling furnace the manganese is completely eliminated when the pig treated is not extra manganesiferous. In the acid and basic converters, as well as in the Martin-Siemens furnace with siliceous or acid sole, the manganese is equally oxidised, but with less completeness than the other elements of the charge, notably the carbon and silicium. In the basic converter, the manganese commences to become oxidised from the outset of the operation, and this action continues insensibly during the work, as will be seen by the following table, which presents the analysis of a series of tests taken at different moments of the operation, to follow the oxidation of the manganese:—

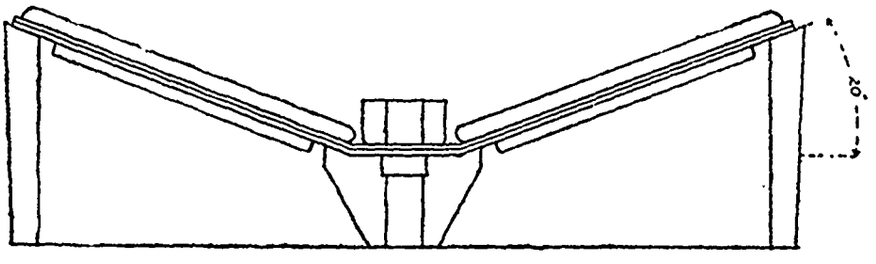
	Manganese. Per cent.
Pig charged	0·520
After 2 minutes' blast	0·430
" 4 " "	0·420
" 8 " "	0·300
" 9m. 15 sec. "	0·250
" 10m. 45 sec. "	0·190
" 11m. 45 sec. "	0·170
" 11m. 51 sec. "	0.120

It sometimes indeed happens, especially in the converter or the acid-Martin furnace, that the almost complete elimination of the manganese presents some difficulties.

Working of the Basic Furnace.—In the basic furnace the presence of manganese plays a very important part. It must be remembered that in this metallurgical apparatus the cast metal, manganese plays a most efficacious part in the work. The final additions introduce into the furnace a notable proportion of manganese, which is employed in part in the reduction of the oxides of iron; the other part is incorporated with the metal, to which it communicates several very remarkable properties, as well in hot working as in its qualities in a cold state. The proportion of manganese which is incorporated thus with cast steel, is very variable. It is rarely, however, higher than 0.500 per cent. in a normal operation, and descends with difficulty below 0.100 per cent. We could attain to smaller proportions were it not that such a metal would stand a great risk of containing oxides dissolved, and it would be very difficult to run it off into good, sound ingots. Given an oxidized metallic bath, it is not very easy to estimate approximately the quantity of oxides which it contains; to bring it out a proportion of recarburates has to be added somewhat greater than would be necessary to work the reduction of the oxides supposed to exist in the bath from its general aspect and the course of the work, so that the metal always contains manganese. Moreover, had we the means of calculating exactly the proportion of oxides, and consequently the weight of the reducing agents, it would always be necessary to add a slight excess of the latter, so as to leave some traces of manganese in the metal, in order to reduce the oxides which are formed during the process of tapping.

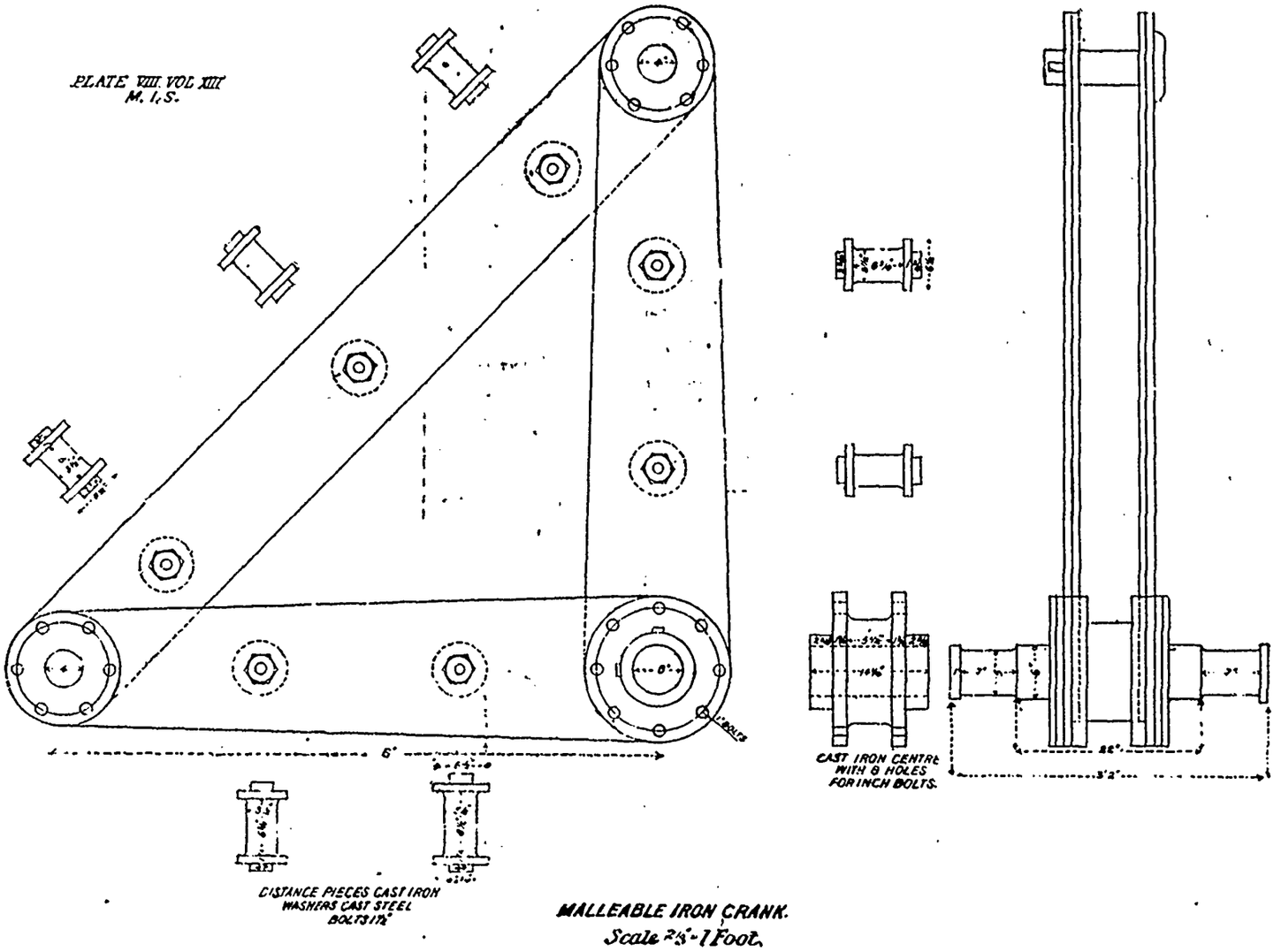
* Colliery Guardian.

To illustrate Mr. William Archibald's paper on PUMPING. PLATE XII. VOL XIII M I S



A New Electrical Company.—As will be observed in an advertisement elsewhere, a new company under the title of H. Ward Leonard & Co., has been formed in New York, to do business as electrical engineers generally, with special attention paid to electrical motor appliances, the transmission of power, the installation of central station lighting and power plants, the concealed wiring of large office buildings, hotels, etc., and plants in which advantages can be obtained by a combination of apparatus of various companies, such as alternating current systems, storage batteries, arc lights, etc. A feature of the business of this concern which is entirely novel, will be the supplying of expert information regarding engineering matters, the operation of different plants and upon the best methods and system of accounts in connection with the operation of electrical plants. Such information will be supplied by correspondence at a very moderate charge per annum. This Company will be actively in business before Sept. 1st. Their offices will be in the Electrical Exchange Building, Liberty street, New York city.

To illustrate Mr. William Archibald's paper on PUMPING.



MALLEABLE IRON CRANK.
Scale 2½"-1 Foot.

The Refining of Sulphides obtained in the Lixiviation Process with Hyposulphite Solutions.*

By C. A. Stetefeldt, San Francisco, Cal.

Steam dried sulphides, obtained in the lixiviation process, are now almost exclusively sold to smelters, the old methods of melting (after roasting), in crucibles, or cupelling with lead at the mill, having become obsolete, principally because they involve accumulation of a large quantity of silver in by-products, that must be sold to smelters under any circumstances.

It would be desirable to refine sulphides at the mill by a humid process, especially when they contain a large percentage of copper, which would be converted into sulphate, the latter being used again in the mill for preparing Russell's extra solution. If refining is done by a humid process, it is hardly necessary to say the sulphides should be nearly free from lead and calcium,† and these metals, if present in the lixiviation solution in perceptible quantities, should be precipitated separately by Solvay soda.

The sulphides should also be free from soluble salts contained in the hyposulphite stock solution, since these salts cause serious difficulties in roasting and contaminate the copper sulphate obtained as a by product. Sulphide cakes from the filter press may hold 50 per cent. and more of moisture. If the sulphides are not washed before going to the filter press, or in the latter itself‡—which practice mostly prevails now—they may contain, after steam drying, a considerable quantity of sodium hyposulphite, sulphate and chloride, besides some other salts. While the percentage of sodium hyposulphite in the stock solution is kept constant, that of other salts increases to a certain limit, which may be very high. In one sample of Marsac sulphides, 11.3 per cent. of these salts was found, and in another, 13.2 per cent. Under all circumstances it is bad practice not to wash sulphides. Steam drying becomes more difficult and expensive, the salts retaining water of crystallization, and if sulphides are sold to smelters,§ freight and working charges have to be paid on worthless material. Besides, the sulphides may take up moisture during storage and shipment, thus causing disputes about discrepancies in weight and assay value.

The whole problem of refining sulphides at the mill presents financial as well as technical difficulties, *i.e.*, commercial success depends on the location of the works.

In one of my papers (*Trans.*, xiii., p. 105), I proposed to dissolve raw sulphides in concentrated, nitrated sulphuric acid, with regeneration of the escaping nitric oxide to nitrous and nitric acid, absorbing the latter by concentrated sulphuric acid. I am now of the opinion that this process is without merit. The principal advantage obtained for it was that roasting the sulphides, with loss of silver, might thus be avoided. But if steam dried sulphides are carefully roasted in a muffle furnace (the muffle being heated only from above, not from below), and the escaping gases are drawn through a Roessler convertor, the loss of silver by volatilization can be entirely precluded.

In my book, *The Lixiviation of Silver Ores with Hyposulphite Solutions*, I described a method essentially the same as that used by A. D. Hodges (*Trans.*, xiv., p. 731), for refining sulphurized, base Comstock bullion, with this difference, that in my plan the sulphuric acid for dissolving copper oxide was to be obtained as a by-product by drawing the sulphurous acid from the muffle furnace through a Roessler convertor. This method, which is only outlined in my book, I shall now consider more in detail. The principal difficulty of the process centres in the roasting. If sulphides are roasted as they come from the drying chamber, after grinding the lumps in a sampling mill, the resulting product is unsuited to treatment with dilute sulphuric acid. No matter how carefully the roasting is done, a granular mass is obtained, consisting largely of metallic alloys, with comparatively little copper oxide. It is not difficult to discover the reasons for this behavior.

1. In burning the free sulphur, the charge commences at once to form little balls.

2. The sulphides are not in the form of a copper silver matte, but consist of individual minute particles of the sulphides of silver and copper.

3. Silver predominates too much over copper.

4. Silver sulphide oxidizes too rapidly, and the copper oxide formed immediately reacts upon remaining sulphides, converting them into metals. Most likely, even at very low temperature, actual fusion of the very fine particles takes place, favoring the above reaction. By continued oxidation, a portion of the copper in the alloy could, no doubt, be converted into oxide, but the preponderance of silver would prevent oxidation to any depth. The same may be said concerning the action of the Roessler convertor. In the latter, metallic copper is readily dissolved by dilute sulphuric acid; but it is not probable that this would be the case with an alloy containing so much silver.

As already mentioned, lixiviation works now ship their product to smelters unroasted. Although, by roasting sulphides, their weight is materially lessened, and the product is obtained in a better and less bulky form for packing and shipping, the objection to roasted sulphides is based upon the difficulty, almost impossibility of their correct sampling, making a fair settlement between buyer and seller a source of much annoyance.

All difficulties in roasting can, however, be overcome if we convert the sulphides into a matte, at the same time incorporating more copper, in the shape of cement copper, in order to obtain a product which permits a good Ziervogel roasting. There is more than enough free sulphur in the sulphides to sulphurize all the copper necessary for their purpose.

Hodges sulphurized base Comstock bullion easily and at a trifling expense in a cast-iron kettle. I see no reason why the matting and copperizing of sulphides could not be done just as well in the manner described by Hodges. He succeeded in roasting a copper silver matte, which contained on an average equal parts of copper and silver, converting as much as 75 per cent. of the silver (on an average, 60 per cent.), into silver sulphate. From the roasted product the copper was almost completely dissolved as oxide by chamber acid.¶ Most probably a

* Transactions of the American Institute of Mining Engineers.

† Concerning calcium in sulphides see my paper on 'The Precipitation of Metals from Hyposulphite Solutions,' presented at this meeting.

‡ Precipitations are washed easily, and with a minimum of water, in a filter press especially constructed for that purpose. In washing sulphides a very small quantity of Na_2S_2 should be added to the wash water to prevent sulphatization of Cu_2S.

§ The freight and smelting charges on Marsac sulphides are $30 per ton; hence, in not removing the soluble salts, from $3.39 to $3.96 are paid for shipping and reducing worthless material that might have been just as well left at the mill.

¶ The bars produced from sulphurized so-called "white bullion" were on an average .967 fine in silver and gold.

copper-silver matte may be successfully roasted, even if silver predominates slightly over copper. But assuming that the relation of silver to copper must be one to one, the amount of copper needed would not be very large where ores are treated by the Russell process, and a comparatively large amount of copper comes to precipitation. All this copper would be returned as sulphate.

The operations of the process would be as follows:

1. Matting and copperizing the sulphides in a cast-iron kettle. Sulphurous acid, produced by burning of an excess of sulphur, should be conducted to the muffle furnace and thence to the Roessler convertor, or to the latter at once. The matte may be removed from the kettle while in a pasty condition, *i.e.*, before solidifying.

2. Pulverizing of the matte through a No. 40 screen.*

3. Roasting in a muffle furnace, with a Roessler convertor attached. The roasting should be conducted as was done by Hodges, *i.e.*, for the formation of a maximum of silver sulphate. Should the sulphuric acid produced in the convertor be insufficient for dissolving all the copper oxide, pyritic ores, containing silver, could be roasted occasionally, at slight expense, to make up the deficiency; or sulphur could be burnt should this prove more economical.

4. Boiling the roasted sulphides (after separating sintered lumps by screening), in a lead-lined tank with the sulphuric acid obtained in the Roessler convertor.

In this operation either of two methods may be selected. One, as described by Hodges, consists in the separate precipitation of the silver sulphate from the solution by copper, if it is desirable to raise the fineness of gold in the insoluble silver residue; the other, in effecting the decomposition of silver sulphate at once by placing copper plates in the dissolving tank. The latter method is the simpler, requiring less apparatus and manipulation, and deserves preference when gold is absent, or present in sufficient quantity to stamp the bars.†

5. Crystallizing the copper solution, if necessary, after concentration.

Since all or most of the copper sulphate is used again in the mill, and not for sale, special attention need not be paid to the production of a fine looking or very pure article. In fact, small crystals are more desirable for the preparation of extra solution than large ones. Mother liquor from the crystallizing vats would be returned to the Roessler convertor.

The concentration of solutions I propose to effect by running them through a lead tower, with inclined shelves, against a current of hot air. The latter would be drawn from the chimney of the muffle furnace by a Koerting steam jet ventilator.

6. Washing of the silver residues (and cement-silver); pressing into cakes; drying and melting into bars.

7. Precipitating cement-copper by scrap iron from wash waters, weak solutions and from mother liquors in which too much iron has accumulated.

In some cases a surplus of copper sulphate over that needed for extra solution in the mill may result. Where this could not be sold at a profit, it should be precipitated by scrap iron, thus keeping in rotation the cement-copper for copperizing the matte.

It will be seen that the process in this form presents no essential technical difficulties, all its operations being well understood by metallurgists; nor does it require large, expensive or complicated apparatus. The refinery should be built on a scale to remain in operation and keep the men employed continuously during the daytime only.

Whether it will be more profitable to refine sulphides at the mill or sell them to smelters, must be calculated for each individual case and depends entirely on local circumstances.

I have no doubt that refining sulphides at the mill would extract a higher percentage of the precious metals, especially of the gold, than is shown by the commercial assay upon which settlement is made between the buyer and seller. Smelting works must have a margin in their favor, or they could not conduct their business with a sufficient profit at the rates they charge for treatment and the percentage they deduct from the commercial assay value. Even the Freiberg works, belonging to the government, have their *Huettenremedien* and extract so-called "plus" silver.

Having in view the erection of a refinery for sulphides at the Marsac mill, Utah, I made the following laboratory experiments.

EXPERIMENTS WITH SULPHIDES CONTAINING LEAD AND CALCIUM.

(Sulphides Unwashed).

The lot of Marsac sulphides, a sample of which was at my disposal, was said to have been produced after the precipitation by Solvay soda of lead and calcium from the solution; but either the precipitation of these metals was not complete, or the sulphides had become mixed with those obtained prior to the introduction of separate precipitation for lead and calcium. The sample contained 34.7 per cent. silver (9.0 ounces gold per ton), 19 per cent. copper and 2 per cent. lead; calcium and other constituents not determined. A few grammes of these sulphides were digested with dilute hydrochloric acid. Carbonic acid and sulphuretted hydrogen were evolved, showing the presence of calcium carbonate* (and lead sulphide). The filtered solution was boiled with potassium chlorate, after which lead and a small amount of iron were precipitated by ammonia. From the filtrate a very perceptible precipitate of calcium oxalate was obtained. Most of the calcium however, remained, with the residue as sulphate.†

In roasting these sulphides in a clay dish in the muffle of a cupelling furnace the free sulphur was burnt quickly, and then a rapid roasting at a very low temperature took place. In elevating the temperature as required for a dead roast, the sodium sulphate (during roasting, sodium hyposulphite and chloride are also converted into sulphate), commenced to fuse, and the final result was a granular mass of brittle, metallic globules, on which continued roasting did not seem to have much effect. On treating them with sulphuric acid of 15° B., not a trace of silver sulphate was found in solution, and after continued boiling only a small quantity of copper was extracted.

Now, 50 grammes of sulphides were mixed with 8 grammes of cement-copper, to raise the percentage of copper to that of silver, and heated in a small cast iron crucible. Some sulphur fumes escaped, and then quick and complete fusion took place at a low red heat. The very liquid matte was poured out. Not a particle of metal had separated, and the inside af the cruicible was not visibly affected. The matte, pulverized and sifted through a No. 40 screen, was roasted at a temperature just sufficient to ignite it. It behaved very well and did not bake in the least just then. But when the temperature was raised, after the blue flame of sulphur had disappeared, the sodium sulphate commenced to fuse, and the roasting dish was filled with a mass like mush. Under still further increase of heat, the charge commenced to foam, through decomposition of sulphates and reaction between oxides and sulphides, and shortly after it hardened into solid, porous crusts. These were pulverized and boiled with dilute sulphuric acid. Rapid solution of the copper oxide took place, and from this solution copper sulphate and a great deal of sodium sulphate crystallized. The metallic residue was fused with borax, yielding silver .790 fine. It can be seen, as observed at the beginning of this paper, that roasting and treatment as above of unwashed sulphides is not practicable. Under such circumstances the roasting is not only very difficult and incomplete, but the resulting silver is too low in fineness and the copper solution is contaminated with sodium sulphate.

The sulphides were now leached with water, and the purified product was subjected to the same treatment as formerly.

EXPERIMENTS WITH SULPHIDES CONTAINING LEAD AND CALCIUM.

(Sulphides Washed).

The direct roasting of washed sulphides proceeded better than that above described; but when the temperature was raised the charge became rather sticky, foamed and then hardened. It contained considerable copper oxide; and, after boiling with sulphuric acid, the insoluble residue, melted with borax, yielded a button about half metal and half matte. The matte contained 35 per cent. of silver and the metal was .897 fine.

After matting and copperizing a sample, as described before, I found that roasting could be carried on without the slightest difficulty, the charge behaving well from beginning to end. I made no attempt at Ziervogel roasting, which is rather difficult anyhow with small samples, and with material containing so much lead and calcium. The temperature was quickly raised after most of the sulphur had been oxidized. At the end the charge was kept at a good red heat. After boiling with acid, the residue yielded a bar .938 fine in silver. With slower and more careful roasting, fine silver would, no doubt, have been produced, although the presence of lead and calcium sulphate must also have exerted an unfavorable influence.

EXPERIMENTS WITH SULPHIDES ENTIRELY FREE FROM LEAD AND CALCIUM.

Having, at the time, no sulphides free from lead and calcium at my disposal, I produced them by converting 10 grammes of silver into chloride, dissolving the latter in sodium hyposulphite solution and adding 40 grammes of $CuSO_4 + 5\,aq$ = 10 grammes Cu. The solution was precipitated with sodium sulphide and the sulphides were washed, dried and matted.

In roasting the pulverized matte great care was taken to regulate temperature so as to form a maximum of silver sulphate, especially by not allowing the charge to get too hot at the end of the roasting. This was accomplished remarkably well. In dissolving the roasted matte nearly all the silver went into solution and was precipitated as cement-silver. The final result was a bar .988 fine in silver.

EXPERIMENTS WITH SULPHIDES CONTAINING ONLY SMALL QUANTITIES OF LEAD AND CALCIUM.

(Sulphides Washed).

Finally, I obtained from the Marsac mill samples of a lot of sulphides containing only a trace of lead and much less calcium than the first lot.

The contents in silver were 34.6 per cent. (8.6 ounces gold per ton), and in copper, 20.0 per cent. Soluble salts, 13.2 per cent. After leaching out soluble salts, a part of these sulphides was matted directly and another part with incorporation of cement-copper, as described for former experiments. Both samples were now roasted with the intention of forming as much Ag_2SO_4 as possible. Only a small portion of the silver, however, was converted into sulphate. This was evidently due to the presence of calcium in the matte.

The sample to which copper had not been added was rather difficult to roast, requiring constant stirring and showing a tendency to sinter, while the copperized matte behaved very well, as described in previous experiments. The addition of copper is of decided advantage in facilitating the roasting, and, in consequence, raising the fineness of the silver after solution of the copper. The matted and copperized sulphides yielded silver .990 fine, while the sulphides matted without addition of copper yielded silver only .938 fine.

The roasting in all these experiments was done in the muffle of a cupelling furnace which held clay dishes of only 3½ inches diameter. In consequence, the roasting of such small masses proceeded too rapidly, which was detrimental to the formation of silver sulphate, and favored the separation of metallic silver alloyed with more or less copper. There is no doubt that finer silver will result after careful roasting on a large scale. Sintered lumps, containing unroasted matte, should, of course, be separated by screening, and, after pulverizing, should be reroasted with the next charge. The presence of small quantities of lead and calcium is evidently not injurious, although it interferes with a good Ziervogel roasting.

This paper would have possessed more value and interest if the experiments had been followed by analysis of the materials and all the products. To do this I had neither the facilities nor the time; besides, such work is done more profitably at the mill, for reasons that require no explanation. I hope the muscular lixiviators will wake up to the fact that their work cannot prosper without analytical help. The present condition of affairs is disgraceful, as has been more fully shown in my paper on "Precipitation."

I refrain from giving estimates of the profit and loss in refining sulphides by the process described above, hoping to do this at some future time, after its introduction in practice.

The Transmission of Power by Electricity.—The *Bulletin de l'Electricite*, in a consideration of the problem of the transmission of power by high-tension currents, states that the official experiments demanded by the German Government from the Berlin General Electricity Company and the Oerliken Metallurgical Works as to their method of transmission of 300 horse power to a distance of 180 kilos. have given results full of useful information. The problem of the electrical transmission of power seems wholly solved by the employment of high tensions, before which the notion of distance between the generator and receiver disappears. It was necessary, however, to make some reservations as to the possibility of utilizing a current of 30,000 volts on account of the difficulty of suitably insulating the dynamos and conductors, besides which it was necessary to determine the conditions under which the disruptive charges took place. The Oerliken experiments do not definitively determine the question, their deviation being too limited. In the experiments under notice an alternating current dynamo giving at high pressure a tension of 100 volts communicated with the circuit of a large transformer wire plunged in oil, of which the circuit of the thin wire was joined on to the line. This, formed of bare wire of 4 mm., was supported by posts supplied with insulators and presenting a working length of 7 kilom., and comes at the limits of the circuit from the thin wire of a transformer also steeped in oil, of which the thick wire circuit communicates with the receiver. In the first experiment the tension at the beginning of the line was 15,000 volts, and 100 volts only at the limits of the generator. In the two other experiments the tension of the principal current was pushed to 30,000 and then to 33,000 volts, the receiver only receiving a current of 100 volts. Carefully taken measures showed that the insulation was perfect, and that no deviation was produced either in the machinery or on the line. The result of this is that it is possible to produce and utilize without losses a current of 33,000 volts; but one cannot judge how long the insulants will resist, and the Frankfort experiments will enlighten us on this point. The dangers arising from a disruptive discharge are less to be feared than one would be tempted to suppose. Two thin wires had been fixed, one to each of the line wires, and their ends by degrees brought together; the discharge spark was only produced at a distance of 22 mm., under a difference of potential of 22,000 volts. The Helios Company have also made similar experiments and recognized that the spark burst at the respective distances of 28 and 64 mm. for tensions of 15,000 and 28,000 volts. Leaden circuit cutters being intercalated on the principal line, the formation of a short circuit was provoked, when the lead melted immediately and the current was interrupted. Such have been the Oerliken experiments, the consequences of which are of a kind to alter the present working conditions of electrical energy.

One cubic foot of matte, pulverized through a No. 40 screen, will weigh about 175 pounds.

† In connection with this point, I made the following experiment: An alloy of pure silver and copper, .500 fine in silver, was boiled with silver sulphate. Cement-silver was rapidly precipitated, although much more slowly than by the use of pure copper. I then took Ontario bullion, .440 fine, which is principally an alloy of silver and copper, and immersed a sheet of it in a silver sulphate solution. The reduction to cement-silver was very slow and ceased entirely after a short time. Probably the presence of a small amount of lead interfered with the reaction.

* Concerning the presence of calcium carbonate in sulphides, see my paper, "The Precipitation of Metals from Hyposulphite Solutions," already cited.

† It is not astonishing that so little calcium carbonate should be found in and dissolved from the unwashed sulphides. In digesting the sulphides with diluted hydrochloric acid, the sodium sulphate present precipitates most of the dissolved calcium as gypsum. In subjecting the sulphides to steam drying, there is also opportunity for converting calcium carbonate into sulphate. Gypsum as such cannot be precipitated by Na_2S_2 from a sodium hyposulphite solution (as constituted after use in the mill), containing calcium.

Concentration of Iron Ores.--Probabilities based on its Success.

By J. Bawden, M.E., Kingston.

The business of crushing low grade magnetic ores and separating the mineral from intermixed rock by various magnetic adjustments has become an established industry in the United States. Some 26 mills are in operation, erected at cost ranging from $15,000 to $300,000. The plants engaged present features of no very distinctive type, and for each is claimed rival qualities of economy and efficiency, which will be determined ere long by extensive experience. The subject of concentration has won the attention of British iron-masters, to whom the proposal to render hematites magnetic by calcination, to be followed by the use of the magnetic separator, seems to commend itself as a practical method of enriching the furnace charge and thereby reducing the cost of fuel. These processes are of interest from their remarkable success in dephosphorization. They have shown conclusively that phosphorus accompanies the ore chiefly if not altogether in the form of apatite in the gangue, possibly as a phosphate of alumina in some ores. The increase of the sulphur content by the concentration process is its sole disadvantage, but it brings out the benefit of initial roasting, which also serves to facilitate the disintegration of some ores. The preparation of iron ores for the furnace is, in consequence of the attention directed to it by the success of the magnetic concentration process, likely to engage much immediate attention. To the furnace manager the subject is obviously commended, but to the mine owner it means the gift of value to properties which have after years of operation been put out of the market by mines offering richer ores, or which have never invited development by reason of low iron content. The first case put is that of several mines in New Jersey and New York, whose record has not supported the popular superstition that ores increase in richness in proportion to their depth. The extent of such property is probably not generally known. The State of New York alone has 14 anthracite, 1 coke, and 8 charcoal furnaces out of blast. There is no scarcity of iron ore, the output for 1888 having been 1,200,000 tons. It was only 4,000 tons less in the year 1879-80. A recent report on the iron mines of the state shows that 30 mines of magnetic ore, 8 of her atite, 11 of bog ore, and 3 of fossil ore are idle. One of the causes assigned for this state of things is the competition of richer mines, in which ore is won at less cost. Within 40 miles of New York the Peekskill mines occur at the southerly end of a range of magnetites, limonites and carbonates, extending 60 miles in length through Putnam, Dutchess and Columbia Counties. The success of large concentration works at the Tilly Foster mine attracts attention to the lean ores of this great iron range, and operations are in progress for the extension of concentrating enterprises. It is probable that ere long the importation of Spanish ores will receive a check from the competition of the product of New York and New Jersey concentration mills. The duty of 75 cents a ton has not interfered with the development of the Juragua mines in Cuba, the property of the Bethlehem Iron Company, from which the yearly output has reached 266,000 tons. Another large Cuban mine of rich magnetic ore is under development, and the extension of trade between Cuba and the United States consequent upon the recent reciprocity treaty with the island is likely to help the mining interest. Over against the successes which the concentration process may win must be set the cheapness with which the hematites of the Southern States are mined, and notably the development of newly discovered mines of great extent in Virginia. This State is coming rapidly to the front as a producer of coal and iron, and there are features in her position which make it altogether probable that she will attain an industrial development which will soon secure for her the very front place in the Union. The recent extension of mine railways in the Pyrenees, and the introduction of machinery to aid the cheap labor of the Spanish mines, will afford American furnaces on the Atlantic coast another competitor to deal with for cheap ores of high quality. In fact the various sources for supply which have been traced leave no room for doubt that on the sea board the American iron making interest is practically independent of the great ore producers of the North-Western States. While Chicago enjoys exceptional facilities for distribution along the path of western extension, it does seem that the south has more varied resources, *a wider range of production, and a more hospitable* sky than the western plains. The situation sketched indicates rather intense competition than that there shall be any friction which will hinder western progress. The Eastern States have had to follow the chariot wheels of a westward moving force, but the regenerated South moves on another line with new energies developing at every step of her progress. Is Canada likely to come in for any favors, or any degree of regard, that will help the development of her mineral interests, while new enterprises are not only absorbing American capital, but balding lagerly for foreign syndicates and foreign shareholders? This question need encourage no pessimism, but the rather provoke energy and enterprise. Without these foreign capital will be of disadvantage rather than gain to us.

The report of the Ontario Inspector of Mines presents a recommendation which merits the consideration of the newly created Bureau of Mines. He says, "Several gentlemen largely interested in the development of the iron industry in Eastern Ontario have suggested that test borings throughout the principal ore occurrences in that district are a necessity to determine their extent and value. The *Iron Age*, the leading journal of the American iron trade, in commenting on the report of the Ontario Mining Commission, suggests that the quantity and quality of our eastern ores have not been demonstrated to the satisfaction of American investors. This opinion, though controverted, is still current with our American neighbors, and no answer so conclusive can be given as proper tests conducted by a competent expert in deep drilling in the magnetic deposits. The results, it is contended, would be invaluable to the investor as well as to science. Sir Richard Cartwright gave the following as his view on this matter: 'As far as I can form an opinion, I am inclined to believe that the very best thing the Government of Ontario could do would be to secure the services of a thoroughly competent Swedish mining engineer or iron-master, and get this gentleman to devote some months to the study of the mines of eastern Ontario. I think most of the Swedish iron furnaces work on charcoal and often with the assistance of water-power, and that the surrounding conditions found here more nearly resemble those existing in Sweden than anywhere else. The Government would then be in a position to decide whether they would grant any public funds to promote developments, or what other steps they would take.'"

Phosphate Shipments from Montreal.

The following are the official returns of the quantities of Canadian phosphates shipped to Europe from the port of Montreal from July 21 to date:

Date	Name of Vessel.	Destination.	Shippers.	Tons.
July 22	SS. Cynthiana.	Hull.	Lomer Rohr & Co.	60
" 27	" Glenuffer.	London.	"	270
" 27	"	"	Millar & Co.	28
" 28	" City of Lincoln	Liverpool	Wilson & Green.	500
" 28	" " "	"	Lomer Rohr & Co.	120
" 29	Bark St. Julien	Cardiff.	"	300
Aug. 1	Ship Mabel Taylor	Liverpool.	Wilson & Green.	370
" 1	SS. Swedish Prince.	London.	Lomer Rohr & Co.	30
" 3	" " "	"	Millar & Co.	75
" 4	Bark Columbia.	Glasgow.	Lomer Rohr & Co.	80
" 6	SS. Fremona.	London.	"	187
" 10	" Princess.	Grimsby.	"	125
" 11	" Osmanli.	Liverpool.	Wilson & Green.	220
				2365

SHIPPERS' RECAPITULATION.

	Tons.
Lomer Rohr & Co.	1172
Wilson & Green.	1090
Millar & Co.	103
Total shipments to date	2365

RECAPITULATION OF EXPORTS.

	Tons.
Liverpool	1210
London	590
Glasgow	80
Cardiff	300
Hull	60
Grimsby	125
Total tons exported	2365

Phosphate Quotations.

Advices from London under date of August 12 are as follows:

"Our market here continues dull and lifeless, but with the advancing season we may hope to see a little more moving shortly. Meanwhile, however, there is no lack of supplies, and especially Floridas are offering liberally.

"From Liverpool the reports are of a similar tenor. We are advised that phosphates of good quality are too plentiful and difficult to sell. With firm offer of 80% they think business might be possible at 1s. delivered weights. 70% Floridas have, we are told, been sold at 9¼d. c.i.f., but on the other hand, still lower grades are rather scarcer, and 60% is quoted at 10½d. delivered weights.

"As regards Hamburg, we hear that Canadian 80% is being offered there at 12d. per unit, and that a sale has been actually made at that price, but it is reported the sellers had a special object in making the sale in order to depress the market to cover themselves for bear sales made some time ago."

The American Sandstone Industry. A bulletin issued by the Department of the Interior, Washington, in relation to the sandstone industry, says the amount of sandstone produced in the United States in 1889 was 71,571,054 cubic feet, valued at $10,816,057, while for 1880 the value was only $4,780,391, an increase during the decade of $6,035,666, or 126·26 per cent.

The Jeffrey Manufacturing Co. of Columbus, Ohio, have in the hands of the printers, a revised Illustrated Catalogue and Price List showing all the chain links and specialties manufactured by them. A wrought chain is one of the latest additions to their already large list of chains. This Company have the largest line of chain links from which to select, of any manufacturer in the world and their list should be consulted by both the dealers and users of such machinery in general.

MINING NOTES.

[From Our Own Correspondents.]

Nova Scotia.

Cariboo District.

The once productive Lake lode has been doing nothing for some time but pumping water, and authentic reports concerning the mine are lacking.

The Dixon property continues to produce largely, and from present appearances will maintain its out-put for some time to come.

The Halifax Mining and Prospecting Co. have ceased operations in this district, and the affairs of the company have been settled here by the manager, Mr. Edward Whidden.

Darrs Hill.

The management report a scarcity of labor, and a shortage of quartz on that account. The western stopes show a larger lode than usual, while the eastern stopes, though showing large bodies, are in low grade rock. The mill continues to give great satisfaction.

South Uniacke.

Reports from this district say Messrs. Thompson & Quirk are expecting bigger returns than usual, the quartz raised being of exceptional richness.

Work on the Nitherow property is reported satisfactory, the grade of the quartz being better than for some time.

No encouraging news is reported from the Neilly property, although the shaft is still sinking.

Waverley.

The lodes of quartz found near the Rutherford farm, about two miles from Waverley, have recently been tested with a reported result of $3 to the ton. The property has changed hands, and a small crew of men are at work prospecting and getting ready to open up the property. The lodes are near a good water power, and should be worked very cheaply.

The Lake View Co. closed down the 1st of August, the pumps, however, are still keeping out the water.

The Sophia Mining Co. have lowered the water in the Tudor lode sufficiently to commence stoping in the western end. No reports as to grade of rock have been received.

Renfrew.

The water in the Ophir lode is below the 250 ft. mark, and a strong lode eight inches thick is visible. This will be opened out next month. Considerable uncertainty exists as to the depth of the old workings, the greatest reported being 400 feet, but the present management think this figure too large.

The Free Claim remains closed down.

Gays River.

The Coldstream Co. have filled their ore bin with material coming from the new shaft, and started their mill on the 10th inst. It is proposed to drop the whole 50 stamps on this mill run.

Pictou.

The Explosives Committee, appointed by the Provincial Government, will meet at Stellarton, on Thursday, September 3rd. The members of the committee are, Mr. E. Gilpin, Inspector of Mines; Mr. H. S. Poole, of the Acadia Co'y; Mr. R. S. Brown, of the General Mining Association; Mr. H. Rae, Spring Hill; Mr. Thos. Johnston, Westville; and Mr. R. Crosby, of Cow Bay. The purpose for which they have been appointed is to ascertain which, if any, explosives may with safety be used in gaseous mines. Now that powder is prohibited in dusty or gaseous mines a safe and reliable substitute is required.

Cape Breton.

A party composed of President I. P. Gragg; Director *M. F. Dickanson, jr.; G. G. Frances, M.E., of London*; W. Ingalls, M.E., of the Mining and Engineering Journal; Pierre Humbert, jr., M.E.; H. O. Aldrich, of Cobb, Aldrich & Co.; G. F. Lord, of Lord & Mandell; Emerson Coleman, of New York; G. H. Newman, of Easthampton, and about a dozen other stockholders and friends of the Eastern Development Company, left Boston about the middle of the month for a two-day trip of inspection of the Coxheath Copper Mines and various points of interest in Cape Breton. They were much interested in examining these mines, and were unanimous in the opinion that Coxheath is destined to be a large producer with a profitable future. The party also visited the International coal mine, the town of Sydney, sailed on the Bras d'Or lake to Baddeck, took a drive in Big Baddeck Valley, and were handsomely entertained by Prof. Alex. Graham Bell at his beautiful country seat at "Beinn Bhregh," near Baddeck. The $350,000 of bonds necessary to erect concentration works, railway and smelting plant of a capacity to handle 200 tons of ore per day, will undoubtedly be immediately provided for, as a result of the actual values shown to exist at this mine.

Quebec.

Eastern Townships.

The regular monthly meeting of the Asbestos Club was held at Thetford mines on the 27th ult., when the large attendance of members justified whatever may have been said regarding the Club's earnest endeavor to make it a success. In the absence of the Thetford vice-president, Mr. A. Ward, Mr. D. A. Brown, of Boston, filled the chair in his usual graceful manner. The usual routine of business being through, the question of refurnishing and fitting of our new club room came before the meeting, when about one hundred dollars was placed upon the subscription list. We trust to have our new club house ready for the August meeting, the 27th inst. Mr. A. M. Evans, M.E., after all business had been transacted, then read a paper on the "Carboniferous Series." It was impossible in a limit of thirty minutes to enter into detail on such a large and interesting subject, and but the smallest "bird's-eye view" could be given of the matter. It was observed that he took the "peat bog theory" regarding the formation of our vast deposit of black diamonds. A vote of thanks was unanimously tendered to him for paper read. On our opening meeting (new club house), we expect to hear a lecture from the Government mining engineer, Mr. J. Obalski, of Quebec.

The all absorbing question is the mining tax among mining men in this district, the Quebec government having sent in the papers for us to fill up *to be taxed on*, and we all simply say we cannot fill them up for the simple reason we honestly believe said tax in said form simply to be monstrous and unjust to every miner in the Province of Quebec. It is not because mine owners or mine managers wish to evade any fair and legitimate tax, but the way in which the tax is taxed is very far from proving that the men who proposed such taxation know the first principles connected with mining enterprises as a whole and in general. If we must be taxed, why, in heavens name! don't they tax us on profits, not on loss?

Our visiting friends from New York and New Jersey, having taken pity upon our being burnt out, in connection with local talent, propose to give a grand concert for the benefit of our Asbestos Club at an early date. We trust its success will be commensurate to the worthy object it aims to assist.

Lievres River.

A number of the principal phosphate companies on the Lievres River addressed a letter to the Minister of Public Works, setting forth the injury that would be done by closing the navigation at Little Rapids in the following terms:—"That we are under engagements to deliver large quantities of mineral which can only be forwarded for shipment by way of the River du Lievre: that if navigation be stopped at this season of the year, the result will be most disastrous to our interests, and that the time for closing the River at Little Rapids, as stated in the above mentioned communication, namely, the 10th proximo, is an unusually short notice. In view of the above, we have to beg that you will cause immediate enquiry to be made into the matter, as to whether the work of constructing a dam at Little Rapids could not be effected during the winter, after the shipping season has closed." This was signed by Messrs. Wilson & Green; J. Lainson Wills, for the General Phosphate Corporation; O. M. Harris, for the Canadian Phosphate Co.; Lomer, Rohr & Co.; and the Anglo-Canadian Phosphate Co. A verbal reply was received from the Department to the effect that it had been decided not to close navigation, but to do the work during the winter or in early spring.

Mr. L. J. Langmead, secretary of the General Phosphate Corporation, is out, going into the general work and accounts for the Fall meeting.

At the Corporation's mines work goes steadily on. On the 8th inst. a scow sank in going through the Long Rapids, with 40 tons of phosphate, which will be recovered.

Mr. E. Watts has left for British Columbia where he will prospect for copper and silver in the Kootenai District for an Ottawa syndicate.

The High Rock property is doing exceedingly well under the new superintendent, Mr. Twidell, the output being steady and of good quality.

Templeton District.

The General Phosphate Corporation have taken out this month about 80 tons of first quality ore from the Murphy lot in the 7th range. 45 men are constantly employed.

Mr. Louis McLaurin has sold his high grade ore to Lomer, Rohr & Co. at Montreal.

The Templeton Asbestos Co. are vigorously pushing their prospecting drifts and are sinking the main shaft to a depth of 100 or 125 ft., and it is their intention to run drifts from that depth into the side of the mountain. 50 men are employed.

Mr. Lederoux left last week for Paris. He goes via Florida where he intends spending some weeks visiting the phosphate workings there. He has concluded not to operate his asbestos claims in the District of Templeton.

The Netherland Co.'s out-put from their two leading pits will be slightly in excess of July. About 40 men and 3 teams are employed.

During the past four weeks McRae & Co.'s out-put from the "Loyalty" mine, with 10 men, has been about 30 tons of firsts and 20 tons seconds. The old disputed show adjoining the Blackburn property is turning out very good at depth. From their property on 11 in the 5th range about 100 tons have been taken out this month.

Messrs. W. M. Schlaesinger, mining expert, and Frank Thomiar, expert driller, from New York, representing the Edison General Electric Co., are installing the electric plant at McRae & Co.'s mine on 11 in the 5th range. The drill was started a few days ago but owing to lack of power a larger engine has to be put in, in order to get desired results from the drill and hoist.

The out-put of the Blackburn mine this month will be in the vicinity of 500 to 600 tons. 100 men and 10 teams are employed.

The McLaurin Phosphate Syndicate's phosphate drawn last winter to the dump on the Blanche is now being transferred to the river front for transhipment to Montreal.

Messrs. McVeity & Kidd have some 14 men engaged in opening up a mica show on the west half of 10 in the 7th, back of Perkins' Village.

Ontario.

Portland Township.

First shipment of asbestos from Mr. Allan's mines has been made, consisting of 67 bags, of various grades, the sale price of which will determine the future workings.

The old French property is being opened up again. Some good surface shows have been recently stripped which promise well for paying work.

The Fleming Phosphate Company's mine, in 4th Range, has been inspected by a competent mining engineer who has pronounced it one of the most remarkable phosphate deposits in Canada. One thousand tons of high grade ore will be taken out in development and shipped the coming winter.

Perth District.

Mr. Edward Watts has just returned from an exploring expedition to the Island of Newfoundland. Two years of diligent search and laborious work by Mr. Watts and his party failed to lead to the discovery of any economic minerals.

Wakefield.

Mr. T. J. Watters has some 40 men working day and night on his mica property recently purchased from Messrs Skead & McVeity. This mine is doing better than ever. Production about 30 tons rough per week. Cutting plant will shortly be put in.

Masham.

Mr. A. F. MacIntyre's lots, 4, 5, 6, & 7 in the 2nd Range of Masham, recently purchased, are opening up well. Some ten or eleven men under John Holmes have been stripping for the past two months. Four distinct leads occur on 5, 6, & 7. As these lots are less then a mile from LaPiche Station G.V.R.R, the property will be handy to work.

Port Arthur.

A car load of ore was shipped from the Badger-Porcupine mines recently.

At Arrow Lake work has been suspended on the Winchell Middaugh on account of water. The main shaft is down over 50 feet, and good fair ore has been ntained right along.

At the Augusta mine there is a force of twelve men now at work. The drift has been driven in to a distance of 49 feet beyond the surface showing, at a depth of over 160 feet, and on the 1st of this month it was estimated that they were about 19 feet from the vein.

British Columbia.

Kootenai District.

In the Silver King the tunnel has been advanced about 70 feet beyond the old cross-cut and the shaft in the tunnel is down about the same distance. The tunnel is run straight, regardless of the course of the ledge, and the shaft has cut the foot-wall of the ore body in which it was commenced. $1,300,000 has been offered for this mine, and refused. At present 21 men are at work, but the force will probably be largely increased in the near future.

The summit of Toad Mountain is beginning to show up like a mining camp, now that development work is being done on half a dozen contiguous claims. On the Grizzly Bear men are at work building quarters and making a face for a tunnel. Superintendent Robertson says he has the finest tunnel site in the district, and on a ledge too that is fully 30 feet in width. A road will be built from the mine to the main road, a distance of 2½ miles through a good country and by an easy grade. The distance from Nelson will be less than six miles.

A claim known as the Tam O'Shanter on the east side of Kootenai Lake, not far from the Blue Bell, is attracting considerable attention because of the size of the body of ore in sight, much of which runs and is of a free milling character. An average specimen selected from the lump assayed $62 in silver to the ton. The claim is bonded to Montreal parties.

That A. M. Esler made no mistake when he purchased the Dandy is being proved by the development work. The tunnel that was started within a few feet of the west end of the ground is in 35 feet, and in ore—the ore being copper pyrites and grey copper. This proves that the ledge is continuous the full length of the claim. A road is now being made to connect the mine with the main road, a mile distant. By the time it is finished a sawmill will be on the ground, one being on the way in. This means that the owners of the Dandy are in earnest, and that by fall the claim will be fully equipped with not only mining, but reduction machinery. The pay roll now carries 21 men.

The Crescent, a claim owned by a Spokane company, has over 8 feet of solid galena ore in the bottom of its shaft, which is down 50 feet. The showing, along with the showing in the lower tunnel of the Fourth, makes claim owners in Hot Springs district feel jubilant. A correspondent at Ainsworth writes: "To-day, at the Fourth, with one man picking and one sacking, the product was 10 sacks of high grade ore. Superintendent Trewarthen is excited."

The Dandy Company, in stripping the ledge above the lower tunnel on the Dandy recently, uncovered a body of fine looking ore, which gives higher returns than that from the surface on the upper end of the claim. The road has been swamped and the stumps blown out, so that machinery can now be got on the ground. At the Grizzly Bear, the tunnel face is under cover, charcoal is being burned, and the boarding house is almost completed. On the Vineta Boy, Ben Thomas, Charles Malley and John Conners are sinking the shaft, now down about 30 feet, 50 feet further. At the Cumberland, a claim recently discovered by Harry Ward, Charles Dundee and A. R. Seaman, a shaft is down several feet in ore that shows grey and peacock copper. The ledge is reported to be fully six feet in width and apparently in place.

The manager of the Kootenai Bonanza Mining Company advertises for tenders for from 250 to 500 feet of tunneling on the Silver King, which means that the own-

ers of that property want to know what they really have before they accept any of the offers made for it. The waggon road is completed to within a short distance of the summit of the mountain, and will be at the Silver King very shortly. About 60 men, besides those on the waggon road, are working for wages on the several claims on Toad mountain. The only sale reported lately was the Lulu, a claim adjoining the Silver King on the north, to E. Ramsay, manager of the Kootenai Bonanza Company.

Ore is being hauled from the Number One mine to the landing at Ainsworth for shipment to the smelter at Revelstoke. Over 200 tons are now sacked, and the contractors expect to haul from six to ten tons a day. The mine continues to look away up, as does the Fourth in the same camp.

The owners of the fraction between the Blue Bell and the Kootenai Chief claim they have more solid ore on the surface than is on either of the big end claims for the same distance. Alec McLeod, Tom McGovern, George Francis, Jack McGinnis, and Dennis Devlin are the owners.

Vancouver Island.

The electrical coal cutters at the Union mines at Comox are giving great satisfaction, and more than fulfilling expectations. The shipments are steady and increasing. It is understood that the company intend increasing their rolling stock to 250 cars, each of a capacity of 25 tons.

An explosion occurred on July 25 in No. 2 shaft of the East Wellington colliery, by which three men were seriously injured. It appeared that one of them had gone into an old and unused air way with a naked light which attracted a quantity of gas which had accumulated there since the test of the previous week. Two men were burned some time ago in this very spot, and it had been since barred off from the main level. No damage was done to the mine, nor were any stoppings, curtains, or doors blown out.

CANADIAN COMPANIES.

The Silver Wolverine Company, (Ltd.)—Under a winding-up order made against this company on June 6th last, the secretary has submitted a statement which shows, as regards contributions, a deficiency of £68,156, and, as regards creditors, an estimated surplus of £208, subject to cost of liquidation. The Official Receiver (Mr. C. J. Stewart) states that the company was registered on October 19th, 1888, and was formed for the purpose of acquiring and developing the Wolverine silver mine, situate in the Province of Ontario. By an agreement dated January 21st, 1889, the company acquired the property from Mr. H. E. Winter, (one of the promoters of the company), the purchase price being fixed at £60,000 payable as to £1,230 in cash, and as to the balance in fully paid-up shares. The property was reported upon by mining experts and others, whose reports and assays were referred to in the prospectus issued by the company. The company commenced operations at the mines in January, 1889. Trial shafts were sunk, and the development of the property proceeded with until May, 1890, when the company appears to have fallen short of working capital, owing, it is alleged, to the non-payment of calls in arrear to a heavy amount, and instructions were sent to Canada to shut down the mine by the end of that month. The mine superintendent, it is stated, did not quit the property until August, 1890, but prior to that date judgment creditors in Canada (who are, for want of any information on the subject, returned in the statement amongst the unsecured creditors) seized and disposed of all the plant and machinery at the mines. The insolvency of the company is attributed by the secretary to insufficiency of working capital, and to operations at the mines, so far as continued, proving unremunerative.

The Hixon Creek Hydraulic Company, (Ltd.)—Application will be made for incorporation under the British Columbia Act of the above company, for the purpose of hydraulic or other processes of mining; to own and construct ditches, flumes and other systems of water ways; to purchase, own, and work mines and minerals; to erect plant to treat same; with other powers. Head office, Quesnellemouth, B.C. Capital stock, $100,000, in 100,000 shares of $1 each. Applicants, James Reid, T. R. McInnes and J. Wilson.

The Canadian Super-Phosphate Manufacturing Company (Ltd.)—We hear that a company under the above title will be brought out in London some time in October, with a capital of £250,000, divided into 49,700 ordinary shares of £5 each, and 150 Founders' shares of £10 each. It is intended to manufacture super-phosphates and other fertilizers, and to this end the North Star mine and several adjoining properties are to be taken up, and also the grinding mills at Buckingham Basin, on the Lievres River, while contracts will be made for a supply o sulphuric acid. The enterprise is based upon the studies and reports of Prof. Francis Wyatt, Ph. D., of New York, and the phosphate properties have been examined and favorably reported upon by Mr. George Atwood, C.E., M.E., of London, Ont. Regarding directors, the London ones have not yet been appointed, but the proposed Canadian advisory board will comprise the following names: W. H. Nicholls, Capelton, P.Q.; Hon. M. H. Cochrane, Alberta, N.W.T.; Hon. C. C. Colby, Hon. Peter MacLaren, Perth, and F. S. Shirley, New Bedford, Mass.

The Straight Lake Mining Company, (Ltd.)—This company will make application for incorporation under Ontario laws, for the purpose of carrying on mining works and operations in the District of Algoma, in the vicinity of Straight Lake and elsewhere in the province; to deal in mines, mining claims and minerals; to mine, smelt, treat, mill and refine nickel and associated ores, with other customary powers. Head office, Toronto. Capital stock, $1,000,000 in 200,000 shares of $5 each. Applicants, D. G. Gordon, J. Howard, O. M. Arnold, H. Vigeon, and A. Gordon, all of Toronto; of whom D. G. Gordon, O. M. Arnold and H. Vigeon are to be the first directors.

Latest Stock Quotations of Canadian Companies in England.

	Price.	
Excelsior Copper, Limited, £410,738 fully-paid shares of £1	——	
Nicola, Limited, £35,000 fully-paid shares of £1	——	
Shuniah Weachu, Limited, £99,888 fully-paid shares of £1	——	
Silver Wolverine, Limited, £68,465 fully-paid shares of £1	——	
Tilt Cove Copper, Limited, £160,000 fully-paid shares of £2	——	
Ditto, £80,000 5½ per cent. debentures	——	
General Mining, Limited, £219,752 fully-paid shares of £8	3¾	4¼
Low Point, Barrasois and Lingan, £509,100 fully-paid shares of £100	——	
New Vancouver Coal Mining and Land, Limited, £185,000 fully-paid shares of £1	⅝	⅞
North-Western Coal and Navigation, Limited, £160,500 6 per cent. debenture coupons, June 30 and December 31; principal 1904	——	
Ditto, £149,500 fully-paid ordinary shares of £10	——	
Ditto, £900 fully-paid deferred shares of £100	——	
Sydney and Louisburg Coal and Railway, Limited, £50,000 cumulative 10 per cent. first preference shares of £10, £6 paid	7½	8½
Ditto, £14,560 fully-paid non-cumulative 6 per cent. second preference of £10	3	5
Ditto, £250,000 fully-paid ordinary shares of £10	¼	¾
Anglo-Canadian Asbestos, Limited, £11,500 fully-paid shares of £1	——	
Anglo-Canadian Phosphate, Limited, £46,510 fully-paid preference shares of £10	——	
Ditto, £25,000 fully-paid deferred shares of £10	——	
White's Asbestos, Limited, £20,000 fully-paid shares of £1	——	
Ditto, £15,000 shares of £1, with 15s. paid	——	
Canadian Phosphate, Limited, £100,000 fully-paid shares of £1	——	
Bell's Asbestos, Limited. £140,000 fully-paid shares of £5	8⅜	8⅝
Ditto, £68,400 debentures, 5 per cent.; interest January 1 and July 1	——	
General Phosphate, Limited, 5 per cent. ordinary shares of £10, £2 paid	——	
Ditto, £5,000 fully-paid founders' shares of £10	——	
Western of Canada Oil, Limited, £200,000 fully-paid shares of £100	——	
Ditto, £99,850 fully-paid shares of £50	——	
Western of Canada Oil, Limited, £199,700 12 per cent. debentures of £100	——	

Excelsior Copper.—Registered September 26, 1888. Accounts to December 31 submitted in April. No dividend yet. Liquidation and reconstruction have been decided upon.

Nicola.—Accounts to December 30 submitted in November. No dividend yet.

Shuniah Weachu.—Accounts to November 20 submitted in February. No dividend yet. Shares for £12,870 held by the Company.

Silver Wolverine.—Registered October 19, 1888. No report of meeting received yet.

Tilt Cove.—In March, 1890, the properties were leased for 99 years to the Cape Copper Company, Limited, at a rent of £4,400. The Cape Copper Company advance £15,000 at 5 per cent. interest, and when this is repaid out of profits; surplus profits are to be divided equally between the Cape Copper Company and the Tilt Cove Company. The lease may be determined by the Cape Copper Company at any time on twelve months' notice. Accounts annually to March 31 submitted in November.

General Mining.—Accounts to December 31 submitted in April, but an interim meeting is held in November. Dividend for 1884, 5 per cent.; for 1885 and 1886, 3⅛ each year; for 1887, £4 13s. 9d. per cent., and for 1888 and 1889, 3¾. Reserve fund, £29,850.

Low Point.—Accounts to December 31. For 1887, 1888, and 1889, 5 per cent was paid each year on the ordinary shares publicly held; for 1888 the ordinary shares issued to the vendors got 3½ per cent., and for 1889, 2½.

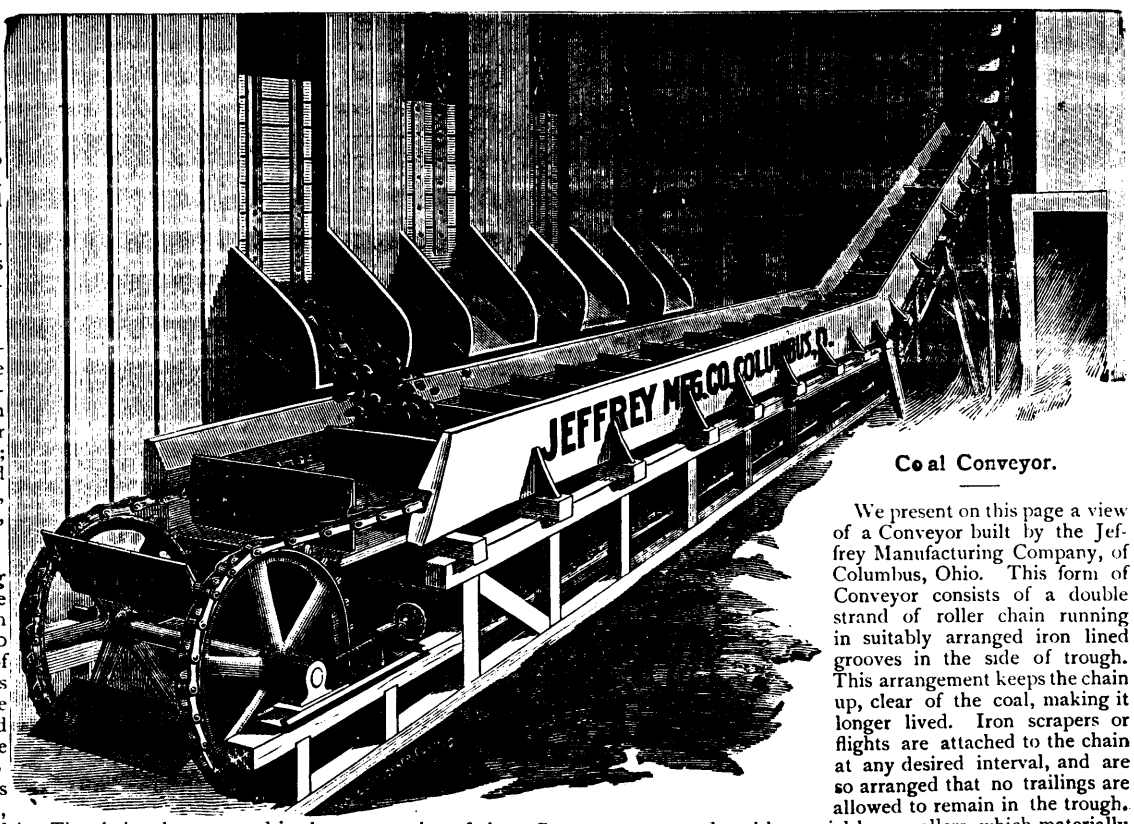
New Vancouver Coal.—Reconstructed in 1889. Accounts to June 30 and December 31 submitted in November and May. For the two half-years to June, 1889, 5 per cent. per annum was paid, and for the two half-years to June, 1890, 4. Debentures, £60,000.

North-Western Coal.—The deferred shares receive no dividend until 15 per cent. per annum (cumulative) has been paid on the ordinary. Accounts to June 30. Dividend for 1887-8 and 1888-9, 5 per cent. per annum.

Sydney and Louisburg Coal.—Accounts to December 31 submitted about May. In respect of 1889 15 per cent. was paid on the first preference, leaving arrears of 50 per cent.

Anglo-Canadian Asbestos.—Reconstructed in 1889. At general meeting held on 16th April, a dividend at the rate of 20% per annum was declared.

Sydney and Louisburg Coal.—The preference shares rank first for 7 per cent., and after a like rate has been paid on the deferred shares, both classes rank equally. Accounts to November 30, submitted in May. No dividend yet on either class. Debit to profit and loss on November 30, 1889, £4,784. One of the mines has recently been sold and another leased.



Coal Conveyor.

We present on this page a view of a Conveyor built by the Jeffrey Manufacturing Company, of Columbus, Ohio. This form of Conveyor consists of a double strand of roller chain running in suitably arranged iron lined grooves in the side of trough. This arrangement keeps the chain up, clear of the coal, making it longer lived. Iron scrapers or flights are attached to the chain at any desired interval, and are so arranged that no trailings are allowed to remain in the trough.

The chains that are used in the construction of these Conveyors, are made with special, large rollers, which materially lessen the power required to drive them, as each link acts as a truck, when running in the iron lined grooves. Coal may be taken into the Conveyor at any point along the line, and may be discharged in like manner, by simply removing suitably arranged slides in the bottom of the trough. For further particulars address manufacturers as above.

NORTH-WEST MOUNTED POLICE

RECRUITS.

APPLICANTS must be between the ages of Twenty-two and Forty, active, able-bodied men of thoroughly sound constitution, and must produce certificates of exemplary character and sobriety.

They must understand the care and management of horses, and be able to ride well.

The minimum height is five feet eight inches, the minimum chest measurement 35 inches, and the maximum weight 175 pounds.

The term of engagement is five years.

The rates of pay are as follows:—

Staff-Sergeants.....$1.00 to $1.50 per day.
Other Non-Com. Officers .. 85c. to 1.00 do

	Service pay.	Good conduct pay.	Total.	
1st year's service..	50c.	—	50c.	per day.
2nd do ..	50c.	5c.	55c.	do
3rd do ..	50c.	10c.	60c.	do
4th do ..	50c.	15c.	65c.	do
5th do ..	50c.	20c.	70c.	do

Extra pay is allowed to a limited number of Blacksmiths, carpenters and other artizans.

Members of the force are supplied with free rations, a free kit on joining, and periodical issues during the term of service.

Applicants may be engaged at the Immigration office, Winnipeg, Manitoba; or at the Headquarters of the Force, Regina N. W. T.

Money Orders.

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

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

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

On Money Orders payable abroad the commission is:

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

For further information see OFFICIAL POSTAL GUIDE.

Post Office Department, Ottawa.
1st November 1889.

FOR SALE.

The following first-class Phosphate lands in Templeton, P.Q:

West ½	of Lot	8,	10th	Con.,	100 acres.
South ½	"	16,	10th	"	100 "
	"	11,	12th	"	215 "
	"	12,	12th	"	190 "
South pt.	"	13,	12th	"	50 "
North "	"	21,	12th	"	147 "
	"	11,	13th	"	161 "
	"	12,	13th	"	132 "
	"	17,	13th	"	47 "
					1142 acres.

These lands are held in absolute fee simple under Crown Patents. In addition to phosphate they contain many other minerals, among which may be mentioned ASBESTOS, MICA and BARYTES. As will be observed, most of the lots are in fairly close proximity, and they adjoin, or are actually traversed by a good county road, affording easy transit to the East Templeton Railway Station and Wharves on the Ottawa River. After personal examination Sir William Dawson, LL.D., F.R.S., F.G.S., the eminent Geologist, reported regarding this property: "In my opinion it has been very judiciously selected both with reference to probable yield of phosphate and facility of transport."

Application may be made to

Mr. L. Marcellais,
Perkins' P.O.,
East Templeton, P.Q.

Or to **Mr. L. T. Paterson,**
Box 2002, Montreal

TORONTO MINING ASSOCIATION,

[LIMITED].

This Association is established to form a centre of information on all matters pertaining to Mining, and a suitable place where specimens may be received and examined.

It is intended to collect in the rooms of the Association specimens of all merchantable Canadian Minerals, with particulars as to place of deposit, and other information which may be useful both from a scientific and merchantable point of view. With this object the Association has decided to open rooms in Toronto within the next few weeks, where information can be sent and obtained, of Mining Properties for sale, and the undersigned has been appointed Managing Director.

The Stock Books of the Association are now open, and mining men and parties having mining properties to dispose of in all parts of the Province are invited to become members of the Association and to send information regarding their properties.

A person can become a member by subscribing for one share of $10 and by paying an annual membership fee of $4.

Further particulars can be obtained by applying to the undersigned,

A. S. THOMPSON,
Managing Director,
Cor. Victoria & Lombard Sts., Toronto.

PROVINCE OF NEW BRUNSWICK.

Synopsis of "The General Mining Act, Chapter 16, 54th Victoria.

—LEASES FOR MINES OF—

GOLD, SILVER, COAL, IRON, COPPER, LEAD, TIN and PRECIOUS STONES.

GOLD AND SILVER.

PROSPECTING LICENSES up to 100 areas, (each 150 feet by 250 feet), issued at 50 cts. an area up to 10 areas, and 25 cts. afterwards per area, good for one year. These Licenses can be renewed for second year, by payment of one half above amount.

LEASES for 20 years to work and mine, on payment of $2 an area of 150 feet by 250 feet. Renewable annually at 50 cts. an area in advance.

Royalty on Gold and Silver, 2½ per cent.

MINES, OTHER THAN GOLD AND SILVER.

LICENSES TO SEARCH, good for one year, $20 for 5 square miles. Lands applied for must not be more than 2½ miles long, and the tract so selected may be surveyed on the Surveyor General's order at expense of Licensee, if exact bounds cannot be established on maps in Crown Land Office. Renewals for second year may be made by consent of Surveyor General, on payment of $20.

Second Rights to Search can be given over same ground, subject to party holding first Rights, on payment of $20.

LEASES.—On payment of $50 for one square mile, good for two years, and extended to three years by further payment of $25. The lands selected must be surveyed and returned to Crown Land Office. Leases are given for 20 years, and renewable to 80 years. The Surveyor General, if special circumstances warrant, may grant a Lease larger than one square mile, but not larger than two square miles.

ROYALTIES.

Coal, 10 cts. per ton of 2,240 lbs.
Copper, 4 cts. on every 1 per cent. in a ton of 2,352 lbs.
Lead, 2 cts. on every 1 per cent. in a ton of 2,240 lbs.
Iron, 5 cts. per ton of 2,240 lbs.

Tin and Precious Stones, 5 per cent. of value.

APPLICATIONS can be fyled at the Crown Land Office each day from 9.30 a.m. to 4.30 p.m., except Saturday, when Office closes at 1 p.m.

L. J. TWEEDIE,
Surveyor General.

MINING REGULATIONS
TO GOVERN THE DISPOSAL OF DOMINION LANDS CONTAINING MINERALS, OTHER THAN COAL, 1890.

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

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

QUARTZ MINING.

A location for mining, except for iron or petroleum, on veins, lodes or ledges of quartz or other rock in place, shall not exceed 1,500 ft. in length and 500 ft. in breadth. Its surface boundary shall be four straight lines, the opposite sides of which shall be parallel, except where prior locations would prevent, in which case it may be of such a shape as may be approved of by the Superintendent of Mining.

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

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

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

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

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

IRON AND PETROLEUM.

The Minister of the Interior may grant a location for the mining of iron or petroleum, not exceeding 160 acres in area which shall be bounded by north and south and east and west lines astronomically, and its breadth shall equal it in length. Provided that should any person making an application purporting to be for the purpose of mining iron or petroleum thus obtain, whether in good faith or fraudulently, possession of a valuable mineral deposit other than iron or petroleum, his right in such deposit shall be restricted to the area prescribed by the Regulations for other minerals, and the rest of the location shall revert to the Crown for such disposition as the Minister may direct.

The regulations also provide for the manner in which stone quarries may be acquired.

PLACER MINING.

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

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

The Regulations apply also to

BED-ROCK FLUMES, DRAINAGE OF MINES AND DITCHES.

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

THE SCHEDULE OF MINING REGULATIONS

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

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

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

A. M. BURGESS,
Deputy Minister of the Interior.