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Established 1882

Vol. XVII--No. 11.

NOVEMBER 30th, 1898.

Vol. XVII--No. 11.

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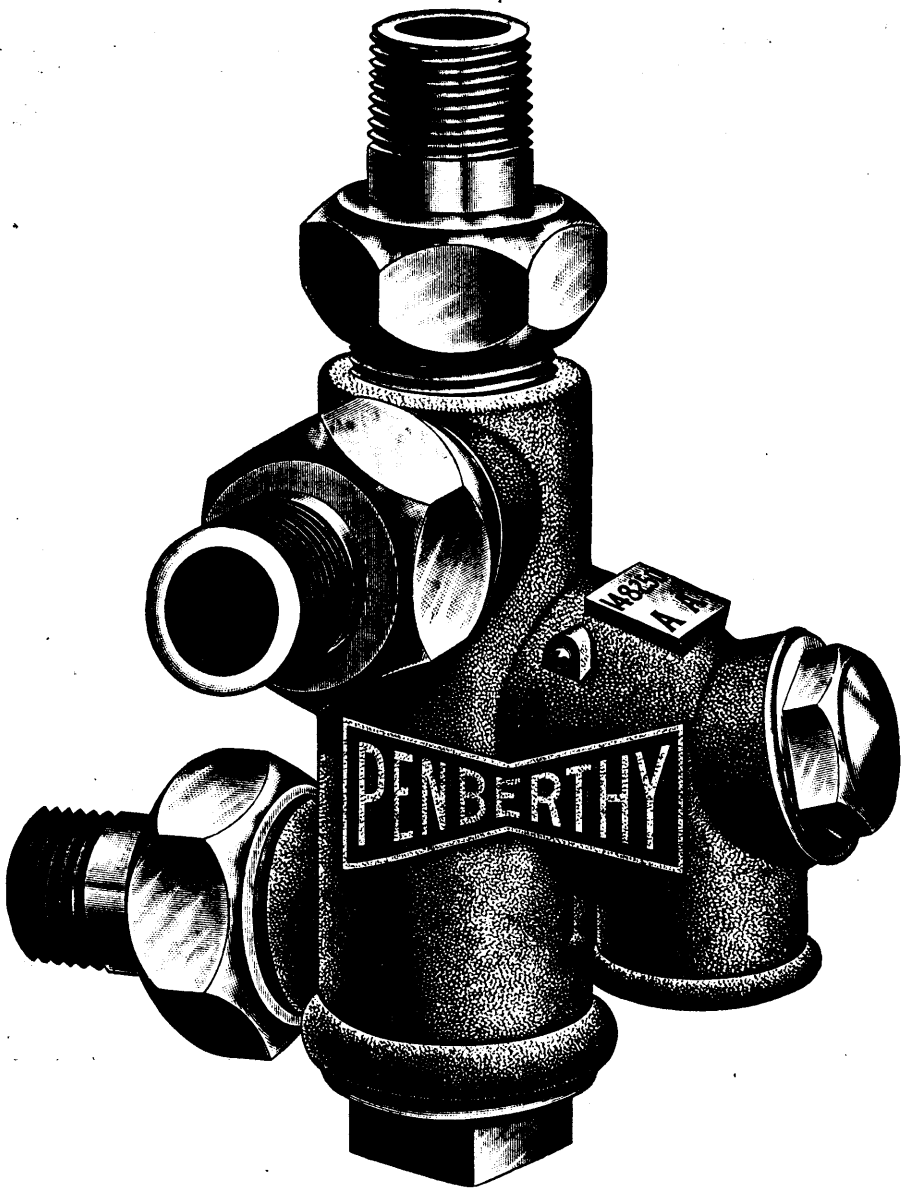
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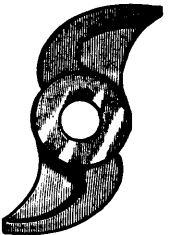
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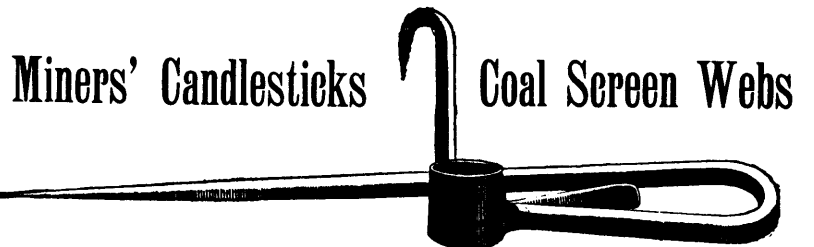
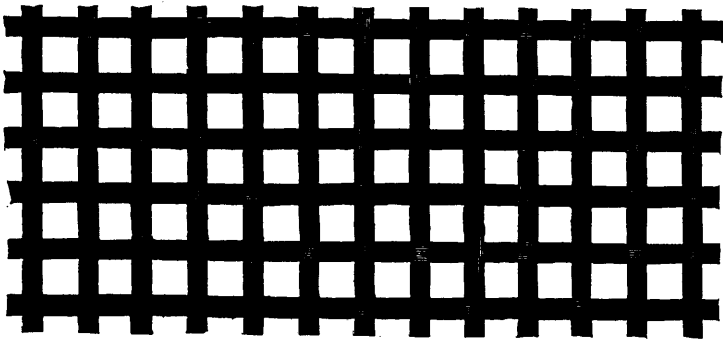
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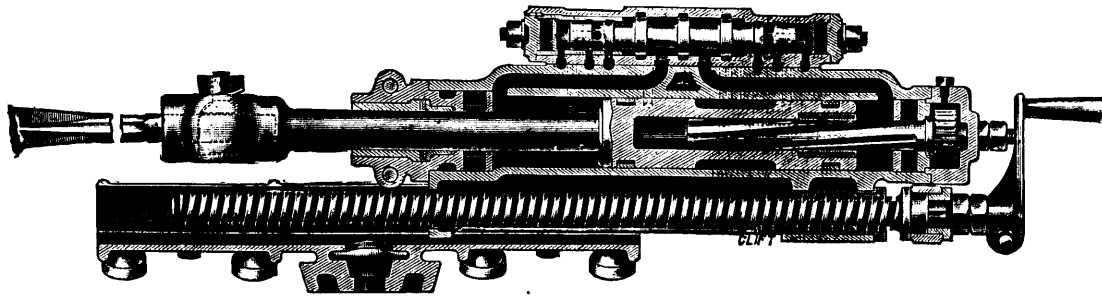
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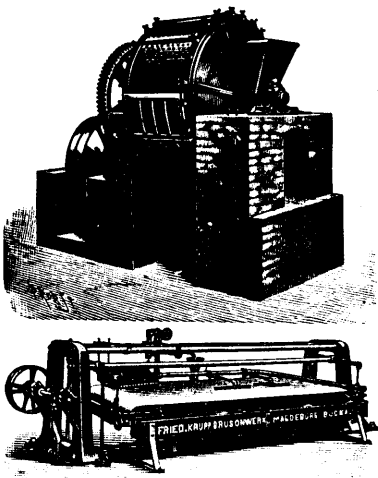
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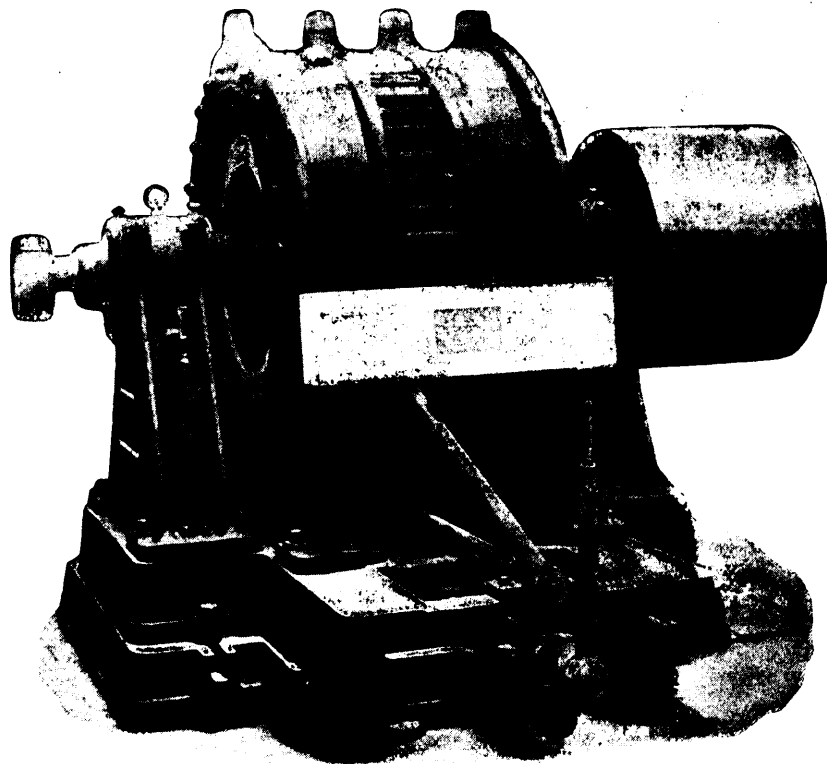
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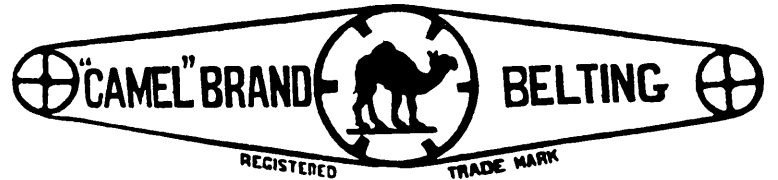
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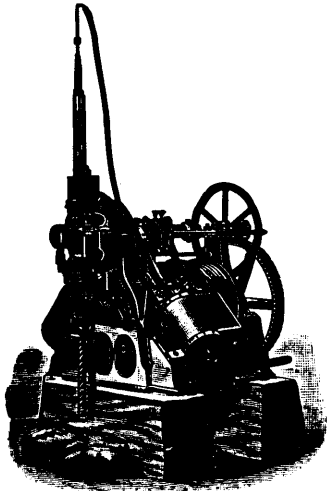
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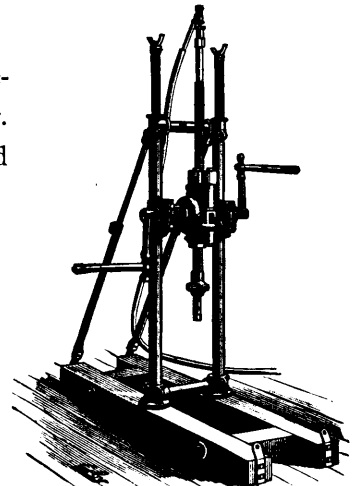
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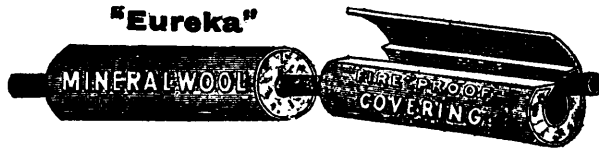
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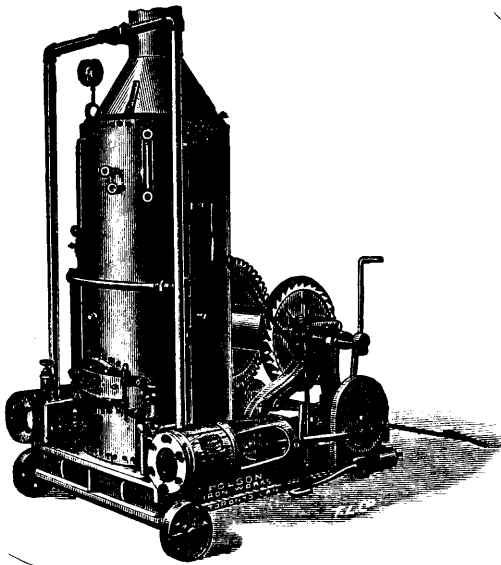
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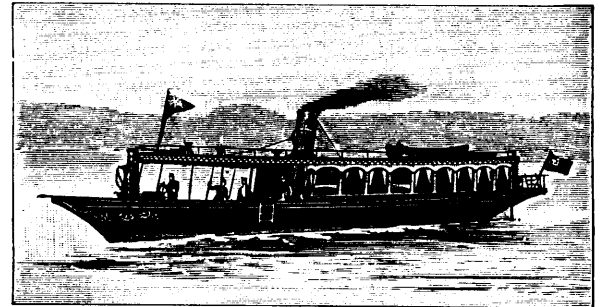
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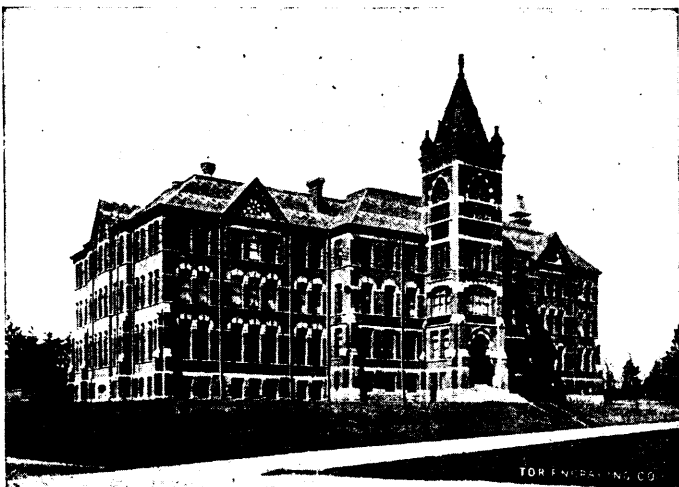
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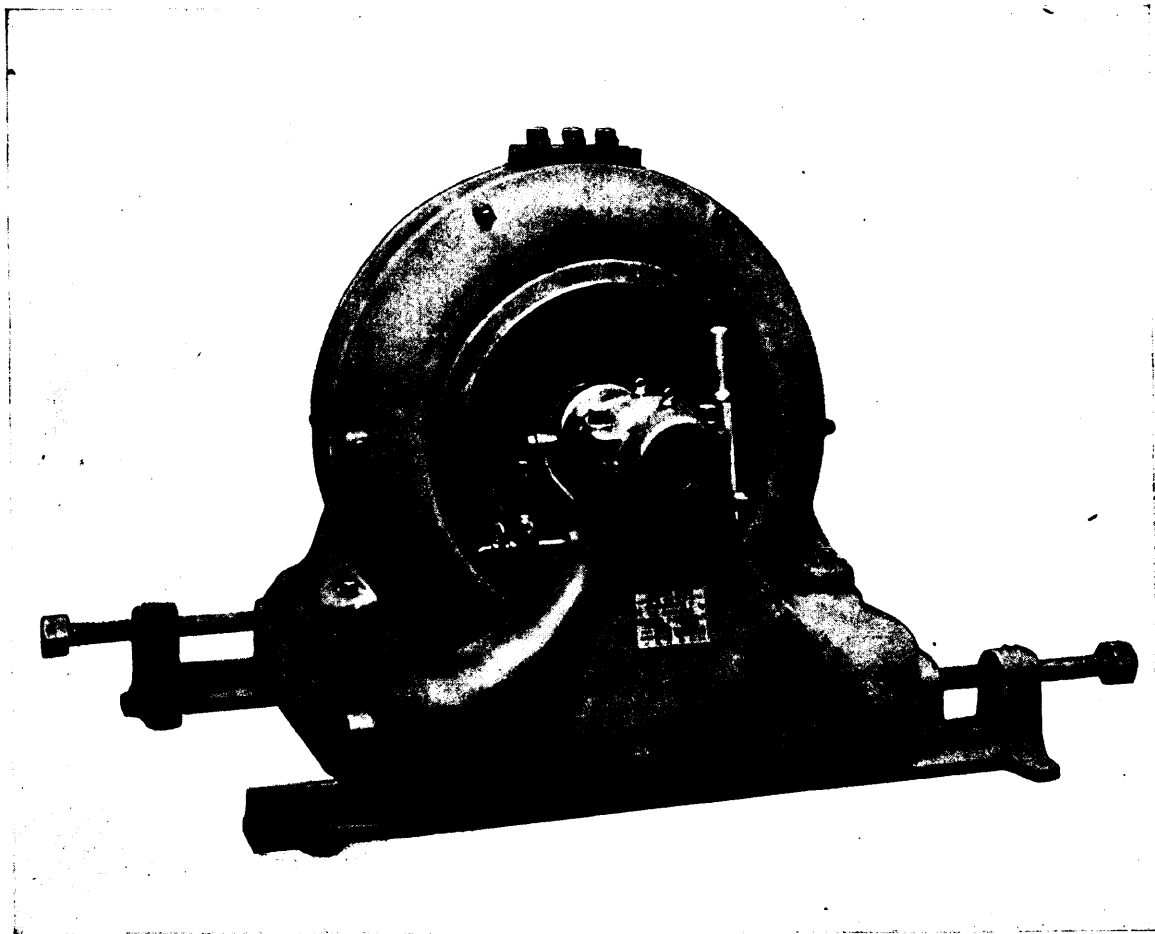
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Gold, Silver, Lead, Copper, Coal, Coke, Oil, Iron, Mercury, Platinum, Etc., Etc.

THE MINES OF BRITISH COLUMBIA
HAVE PRODUCED OVER \$112,000,000.

AMOUNT AND VALUE OF MATERIALS PRODUCED 1896 AND 1897.

	Customary Measures.	1896.		1897.	
		Quantity.	Value.	Quantity.	Value.
Gold, Placer	Oz.	27,201	\$ 544,026	25,676	\$ 513,520
“ Quartz	Oz.	62,259	1,244,180	106,141	2,122,820
Silver	Oz.	3,135,343	2,100,689	5,472,971	3,272,836
Copper	Lbs.	3,818,556	190,926	5,325,180	266,258
Lead	Lbs.	24,199,977	721,384	38,841,135	1,390,517
Coal	Tons	894,882	2,688,666	882,854	2,648,562
Coke	Tons	615	3,075	17,832	89,155
Other materials			15,000		151,600
			\$7,507,946		\$10,455,268

Production for 1890, \$2,608,608; for 1896, \$7,146,425; for 1897, \$10,452,268.

GOLD.

Gold-bearing lodes are now being prospected in many parts of the province, and at Rossland magnificent ore-chutes of very profitable gold-copper ore are being mined and smelted, the Le Roi having paid to date, \$725,000 in dividends, with a large and increasing amount of ore in sight as the workings attain greater depth, while systematic development on other properties is meeting with excellent results, mining having just fairly begun in this camp. Little doubt can now be entertained that Rossland will become a heavy producer of gold, and that excellent properties now only await sufficient and abundant capital to become paying mines, to further aid in which the facilities for cheaper transportation and smelting are being now supplied. At NELSON and at FAIRVIEW, CAMP MCKINLEY, GREENWOOD, CENTRAL and other camps in the southern part of Yale, important work is being done on the quartz ledges there, several new mills being under erection.

Exploratory work is also in progress in EAST KOOTENAY and in LILLOOET, ALBERNI, and on the Gulf islands and along the coast line of the mainland, as well as in other parts of the province.

In CARIBOO, several large undertakings, involving a large amount of capital, are at work exploring both modern and ancient river channels, the Cariboo Hydraulic Mining Co., on the Quesnelle river, proving, on development, to have in a channel of the latter kind, a great gravel deposit of exceptional richness, while other parts of this district now offer every inducement to capital.

Into CASSIAR, OMENICA, and the great area to the north, as well as Cariboo, there now promises to be a great exodus of explorers, incited by rich diggings now being mined in the YUKON, as on the KLONDYKE, to the north, and river and creeks long reported to be gold-bearing will now be made accessible, and well tested.

SILVER-LEAD.

Despite the drop in the price of silver, the SLOCAN mines are being much more extensively worked, while the shipments of high grade ore are constantly increasing, the higher price of lead more than compensating for the lower silver values. The production for 1897 has much exceeded that of 1896, as such mines as the "Payne," "Ruth," "Whitewater" and other mines increased their output.

At NELSON, the "Silver King" or Hall mines is shipping constantly a large amount of silver-copper ore, and the LARDEAU, TROUT TAKE, ILLECILLEWAET districts, on further exploration, promise to become rich districts. In EAST KOOTENAY large bodies of silver-lead ore will be mined on completion of the railroads now under construction.

COPPER.

Copper is being produced to a limited extent at ROSSLAND and NELSON, but the large deposits of at present low-grade ore in the BOUNDARY CREEK district will be fully tested when the railroad, now almost assured, is constructed. Prospecting is being done at KAMLOOPS, along the west coast of

the mainland and of Vancouver island, as well as at many other points, and TEXADA is producing high grade bornite ore.

COAL AND COKE.

The large collieries on VANCOUVER ISLAND are producing about a million tons of coal annually, and at COMOX an excellent coke is now being produced, much of which is shipped to the inland smelters. The great deposits of coking coal in East Kootenay, at the CROW'S NEST PASS, are now being opened, as the C.P.R. is now being built to the Columbia river to supply the great mining regions with cheap coal and coke.

SMELTERS AND RAILROADS.

The smelting industry is now beginning to assume large proportions, as preparations are being made to treat the ores of this province within her own borders, a most important factor in the increasing prosperity of this country, entailing as it does, and will, the employment of much capital and many men. The extension of the railroad systems to different parts is now in progress, and the next few years will see many parts in which the prospects for good mining are excellent, made easy of access, while ores can be shipped with facility to the smelting centres, where the assembling of the various interfluxing ores will make possible the treatment of all British Columbia ores at home.

CAPITAL.

Capital can now find here excellent and many opportunities for investment, if proper business care and the experience of qualified men are utilized, as the values placed on mines and undeveloped properties have reached a reasonable basis.

MINERAL LANDS.

Mineral lands are open to location to any person over eighteen years of age, who has obtained a free miner's certificate, and perfect titles to lode claims can be easily secured after \$500 worth of work has been done per claim. A great extent of territory has yet to be prospected.

YUKON GOLD FIELDS.

As the KLONDYKE and other gold fields in the Yukon in British territory is reached mostly via British Columbia, all SUPPLIES and OUT-FITS obtained at VICTORIA, VANCOUVER, ASHCROFT, KAMLOOPS, etc., can be taken in FREE OF DUTY, which otherwise WILL HAVE TO BE PAID if not purchased in CANADA.

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GOLD AND SILVER.

Under the provisions of chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold 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. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable 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 on smelted gold valued at \$18 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 search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas 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 for a nominal fee, 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, 10 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

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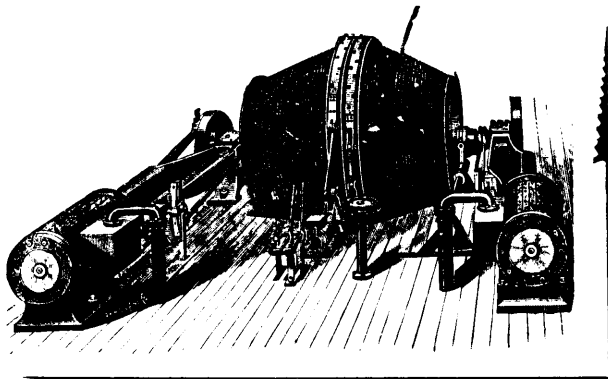
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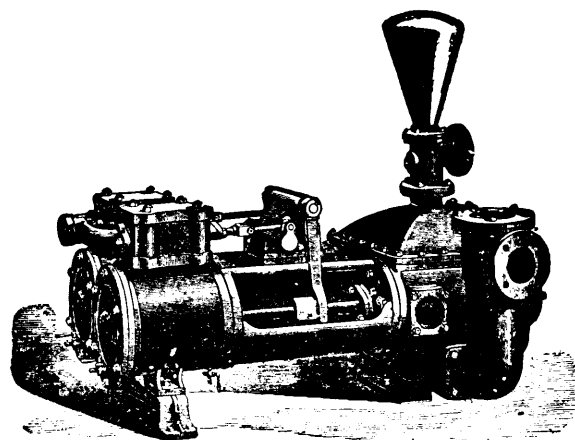


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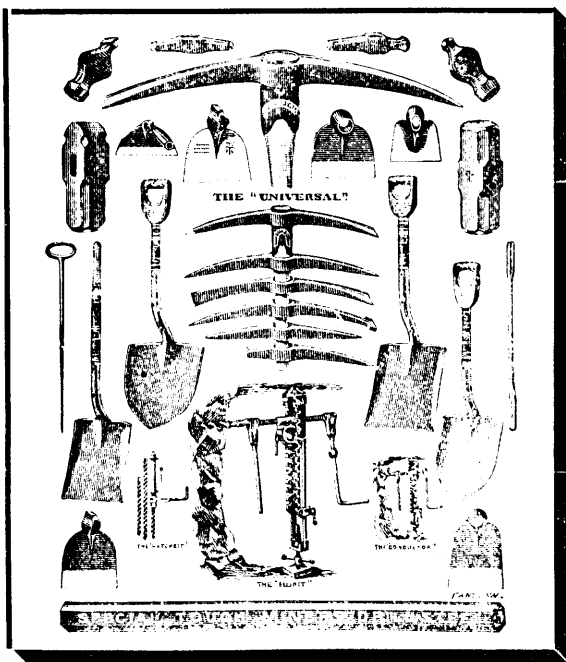
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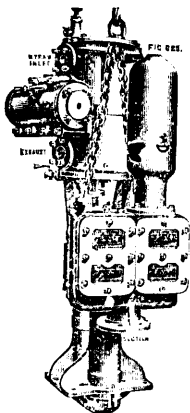


Fig. 620—"Griff"
Sinking Pump.

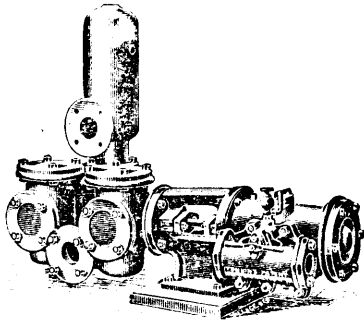


Fig. 598—"Cornish"
Steam Pump
for Boiler Feeding, etc.

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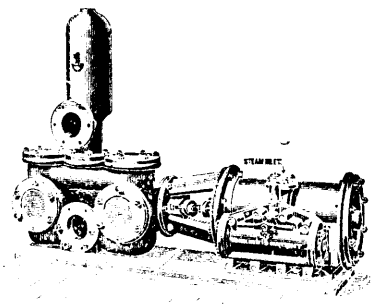


Fig. 600—"Cornish"
Steam Pump
for General Purposes.

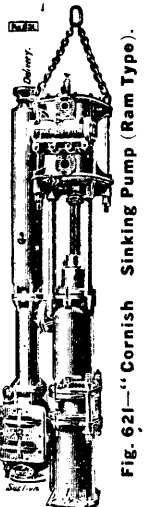


Fig. 621—"Cornish"
Sinking Pump (Ram Type).

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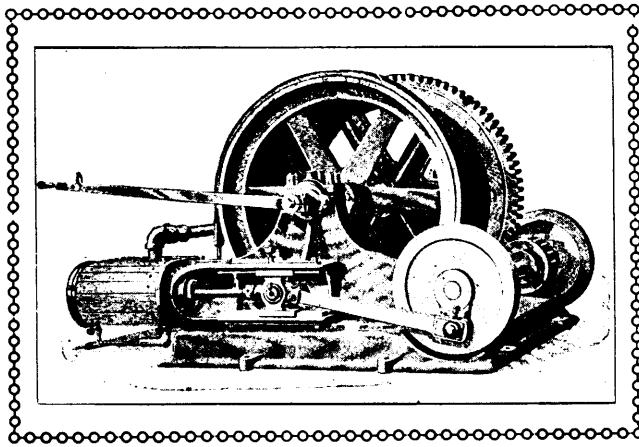
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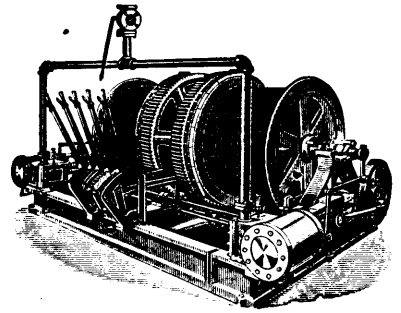
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The Smelting of Gold and Silver Ores in British Columbia.

The Canadian Pacific Railway Company is, of course, more largely interested in the development of the Canadian Northwest than any single individual or corporate investor can be; for the general prosperity of individual enterprises must be the foundation of the prosperity of that great agency of transportation and communication. In recognition of this fact, the business of smelting gold and silver ores in British Columbia has been specially encouraged by the Company. Under its auspices, extensive works already erected by United States capital have been purchased and practically reconstructed, so as to cover a much larger range of ores, including those of silver, lead and copper, as well as gold, and are already running with complete metallurgical and economical success, and with the prospect of further enlargement. This has been accomplished without the aid of any export duty on ores, such as was formerly asserted to be necessary to such an undertaking; and it must be evident to all parties that an enterprise thus successfully established without artificial aid is certain to prove itself both more stable and more beneficial to the community than if it were supported by an export duty, which, if effective at all, would be practically a present tax on the miner for the benefit of the smelter, and for the sake of the expected future benefit to be derived from the establishment of a new business. The most extreme protectionist cannot but rejoice when an industry shows itself independent of legislative protection.

The policy of forcing the birth of an industry by protective duties is always, more or less, an experiment. Often, it turns out well; sometimes, at least, it proves to have been premature. But after an industry has established itself, the wise adjustment of legislative provisions to its proper encouragement is less problematical. An illustration of this proposition is furnished by the present situation of the smelting business in British Columbia, as we hope our simple statement of that situation will satisfactorily demonstrate. In this statement we shall confine ourselves to the subject of the smelting of silver-lead ores — of which, as our readers are aware, British Columbia has an enormous amount, and in the metallurgical treatment of which Canadian establishments must compete with establishments not far over the border, in the United States.

The product of the smelting of such ores is argentiferous lead, generally known as "base bullion," which must be further treated in refineries, where the lead and silver are separated, before it can be sold in the market. In other words, there is a commercial market for pure lead, and for pure silver; but only refiners will buy the base bullion, composed of lead and silver, together with impurities left therein by the first smelting-process.

Now, there are at present no refineries in Canada. If the Canadian smelter ships his base bullion to the United States to be refined, he must pay the United States import-duty on the lead it contains; and if this lead be afterwards brought into Canada for sale, it must pay the Canadian import-duty, just as any other lead does. In other words, the Canadian market for pure lead offers no advantage to the Canadian smelter of lead ores. On the contrary, he is, to some extent, handicapped in the competition between himself and his rivals in the United States, who enter the Canadian market on equal terms with him, while they hold the United States market, from which he is practically shut out.

In this situation there are two possible remedies, which we will proceed to consider.

1. The Canadian smelter, it may be suggested, can add a refinery to his smelting works, and so produce refined lead for sale in the Canadian market. In that case, the existing regulations would have operated to force the establishment in Canada of the refining business, in addition to the smelting business. It is a pretty scheme, if it would only work successfully. But the experience of our neighbors in the United States has shown that the attempt to attach a refinery to a smelting works is likely to wreck both. It is not profitable to produce refined lead and silver (often at high cost of fuel and wages) in the mining districts, and then transport them, at increased expense of freight and insurance, to the commercial centres where they must be sold. On the other hand, capital cannot safely establish refineries at or near such centres, on the strength of expected supplies from single smelting works only. There is a fair profit in refining, provided the supply of "base bullion" be large and constant, but not otherwise. When this condition is fulfilled, the business will spring up of itself. Until that situation exists, it can only be forced into being by legislative premiums and penalties unwarrantably burdensome upon both the miners and smelters of ore and the consumers of metal.

2. Obviously, the effective and harmless way of securing the ultimate establishment of the refining business in Canada is to encourage the smelting business until its product will justify the establishment of Canadian refineries. And this encouragement can be given without laying upon either miners or consumers any new burden.

The means are simple. Under the United States law (as under any sane tariff system, however highly protective) "base bullion" can be received "in bond," free of the United States import duty, for metallurgical treatment and subsequent export. It is only necessary that the marketable lead, thus produced from Canadian base bullion, shall be admitted into the Dominion free of duty; and the thing is done. The Canadian smelter can then turn his crude product into marketable form

without further extra cost than that of freight, while this cost (which is by no means a trifling item) will be a constant argument for the establishment of Canadian refineries, whenever that step shall be economically practicable

On the other hand, we do not see how either the miner or the consumer would be injured by such a measure. The price of ores would not be reduced to the one, or the price of lead advanced to the other—both these being controlled by international competition. And, if the measure here suggested should effect (as it might be confidently expected to do) a rapid extension of Canadian smelting, both miner and consumer would doubtless profit by the result.

The miner would be, perhaps, the first to experience this benefit; for experience has shown abundantly that multiplication in the number and increase in the capacity of smelting works produce, immediately and irresistibly, a greater demand for the raw material of smelting, and consequently higher prices for ores. Moreover—and this is a matter still more important to the mining industry—the range of ores which the smelters will take at fairly remunerative prices is greatly enlarged by such an extension of smelting. No mining district can be considered permanently prosperous, so long as its rich ores only are commercially available. The richest district that was ever discovered contained more low-grade than high-grade ores; and it is not until the former, as well as the latter, can be profitably utilized, that mining stands upon a secure basis

A striking illustration of this proposition is furnished by the recent development of mining in Mexico. Only a few years ago, there were innumerable Mexican silver-lead mines, the owners of which were quite content to derive a limited but satisfying income from the shipment to United States smelting works, in moderate amount, of selected rich ores; the material of lower grade, which would not repay the cost of such shipment, being entirely neglected. By the mistaken imposition, on the part of the United States, of a heavy import duty upon the lead contained in such rich silver ores, their importation was discouraged, for the fancied benefit of United States lead miners. We presume no one would now deny that the levy of this duty was a mistake on the part of the United States. Almost the only lead mining industry of that country which it benefitted was that of the *Cœur d'Alène*, in Idaho, which neither needed nor deserved such encouragement, and to the advantage of which the measure subjected to great loss, not only the lead smelters of Colorado, etc., but also the miners of "dry" or quartzose, non-lead-bearing silver ores, who had to meet the increased cost of metallurgical treatment caused by the scarcity and high price of the lead ores required for economical metallurgical smelting mixtures.

But we are not here concerned with this aspect of the case. The more important result of the legislative mistake we have indicated was the immediate stimulation of smelting in Mexico; and most important of all was the incidental and inevitable extension of Mexican mining. Many millions of capital (largely American) were invested in Mexican smelting works; and such works, once established, could not stop with the treatment of rich ores, but required immense supplies of lower grades. The speedy result was an enormous increase of the Mexican output of both lead and silver, to the immeasurable injury of the United States producers of both; but, at the same time, to the great advantage of Mexico, where mines which might have continued for another generation to ship only their richest ores, without disturbance of market prices, were thus forced into vigorous development, and enabled to utilize their entire product. It is quite immaterial to this great result whether the base bullion be refined in Mexico, or shipped thence to be refined elsewhere; and it would be very poor policy on the part of the Mexican government to hinder the wonderfully beneficent operation of such a development of national resources by a premature attempt to force the establishment of the additional industry of refining.

A similar result (though, for reasons of geography, topography and transportation, not so marked), has been produced in British Columbia by that mistake of the United States. It has directly encouraged the establishment of Canadian smelting works, the effect of which has been already and will continue to be, in increasing measure, the extension of Canadian mining in the branches affected.

In short, we think that the interest of the miner, as well as that of the local communities and of the Dominion at large, would be best served at this time by the moderate and reasonable encouragement of the lead smelting industry, especially in British Columbia, which we have suggested above, namely, by the simple admission into Canada, free of duty, for the present, of lead smelted in the Dominion from Canadian ores, and refined abroad.

In connection with the expression of this view, we take occasion to add that we have had no communication on the subject from the representatives of the Canadian Pacific Railway or of Canadian lead smelting establishments, and also that we do not at all mean to bind ourselves to the advocacy of this or any other specific measure at another time and under other circumstances. We have in view simply the existing situation, and the immediate problem which it presents. In our judgment, this is the necessary character of all wise legislation in promotion of home industries. An absolute and consistent "free trade" policy does not call for any wisdom at all. Once adopt the formula, "Every one for himself, and the devil take the hindmost," and you may not get prosperity and progress as the result, but you will have no need of further thinking. On the other hand, those who believe, as we do, that prosperity and progress may be promoted by wise legislation, must accept the necessity of continued vigilance, inquiry, argument and revision. This necessity we, for our part, do frankly accept; and we feel ourselves, consequently, free to take, at any time, either side of any question of "protection" presented for our consideration, acknowledging only the obligation to give the reasons for our opinion. This obligation we have discharged, as to the present case, in the present article.

Mine Valuation, from an Investor's Standpoint.

To accurately solve the problems involved in the important questions of the duration of the life of a metal mine and the determination of its present value, has been an object long and eagerly sought by mining engineers of all nationalities. Papers bearing upon the subject are not infrequent in technical literature which treat the subject from a strictly mathematical point of view to an ordinary commercial aspect. One of the most recent efforts in this direction is an extensive monograph by F. Hellman, a South African engineer, who attempts a solution by an elaborate system of algebraic equations; his known quantities being the yield of the ore, cost of working and the amount of ore in sight, and the unknown quantities and their approximate values being figured out in a very ingenious though unsatisfactory manner. Another recent article has appeared in the *Sud Africanische Wochenschrift*, which deals with the matter from a commercial standpoint, adopting the American point of view that the life of a producing mine, and consequently its present value, is entirely dependent upon the rate of its production. As regards the problem of valuing mines, the elements which enter into it are so many and so diverse, including factors of capacity, accessibility, costs of mining, labor, supplies and transportation, with facilities for working, freights on products, etc., etc., which are all more or less dependent upon time and place as to make possible only approximations more or less exact.

The legal definition of a "mine" varies somewhat with the country in which the mine is situated; in the United Kingdom the nature of the excavation, and not the nature or quality of the mineral, decides whether the working is a mine or not. On the contrary, in Belgium, France:

and Italy the classification depends upon the nature of the *mineral wrought*—metallic ores, sulphur, coal, etc., being classed as mines, other substances not. From the investor's standpoint a mine is a defined deposit of mineral which can be extracted and marketed at a profit; when the profit ceases the mine ceases, so far as he is concerned. The dimensions of this mineral deposit are more or less definite, and the amount of the mineral, commercially profitable, which it contains is a question which does not pass out of the realm of approximately exact calculation. From this definition, therefore, it must be apparent that the *life* of a mine (and consequently its *value*) is entirely dependent upon the amount of its mineral which can be extracted in any given unit of time, say per year.

Were it possible to ascertain these definite dimensions at the inception of a mining enterprise the risk of such ventures would be very much reduced, and it is just the lack of such definiteness which gives to mines a more or less speculative character as they are at present conducted. Few deposits of mineral in their early years are so fortunate as to have owners able to undertake such explorations as would give exact figures from which calculations could be made; nevertheless the large mines of the world are precisely those which have undertaken to define their deposits as quickly as it has been possible for them to do so: witness the proving of the Calumet lode by the Red Jacket shaft to such a distance from the limit of present workings as to justify the management in estimating that the mine possesses reserves which at the present rate of production will last for fifty years longer. Witness also the proving of the banket reefs of South Africa by the deep level workings, and the constant development which enables the Alaska Treadwell and the Homestake mines to calculate or predict their output for many years to come. The developments of the properties mentioned bring these mining ventures almost within the category of industrial undertakings, and put them as it were on a par with the railway enterprises (both steam and electric) of the country. But with the vast majority of mining concerns no such definition is attempted and no such reserves can be shown, and the statistics available show that the profitable life of almost all precious metal mines is under rather than over ten years.

In the preparation of returns for the United States Census Office, the problem of valuations was considered as analogous to, or in the nature of, an annuity, with the stipulation that a mining adventure, even when most successfully conducted, demands a redemption fund taken from the profit and loss account. Iron mining is generally considered to be characterized by a greater permanency than other metallic mining, and in the valuation of some of the iron deposits of the United States by a Census officer it was considered that a ten per cent. dividend was not too much to allow for a reasonable profit upon the capital invested, and that four per cent was the lowest figure sufficient to provide for a redemption fund, making it obligatory upon the property to earn per annum in all at least a fourteen per cent. dividend; and further, the average period of productiveness was put at fifteen years.

In Hoskold's tables ("Engineers' Valuing Assistant") the *present* value of \$1.00 per annum upon which interest is allowed at 14 per cent. (10 per cent. for profit and 4 per cent. for redemption) in fifteen years is \$6.67, or let us say \$7.00—giving as a basis for valuation the multiplication of the annual dividend by seven. Should the rate of interest become higher, the present value becomes less, the value of \$1.00 on a 24 per cent. interest falling to \$3.00.

Let us take another method. In looking over the statistics of some of the largest and most valuable mines of the North American continent we find that the percentage of the gross value of mineral produced, which is paid as dividends, will vary from 20 to 30 per cent., in no case reaching the high figure of 50 per cent.

In the statement for the year ending July 31st, 1898, of the largest copper mine in the world (the Anaconda), we find that only 20 per cent

of the total gross value of the ore went into the profit and loss account; from the best figures we have been able to obtain regarding the LeRoi, the ratio is about the same as with the Anaconda. With free-milling instead of smelting propositions the ratio is larger, increasing, in the case of the Homestake Mining Company, to about 30 per cent. On the contrary, with the Lake copper deposits, the ratio falls below 20 per cent.

If, therefore, we have a company whose reserves are known, or stated, we shall not be far wrong if we take 20 per cent. of those reserves as possible profits, in the case of a smelting ore; or 30 per cent., in the case of a free-milling ore.

In the light of these two methods of approximating the present value of a mine, or of the shares of a mining company (which *may be* the same thing), the prices quoted for some mining shares now prominently before the Canadian public must be regarded as purely fictitious. On the basis of the highest market figure thus far reached one of these properties is given a valuation, in round numbers, of \$6,000,000. It has not yet been a dividend payer for twelve consecutive months, but on the basis of the dividends which have been declared let it be assumed the annual dividend is \$350,000. On the first basis of obtaining valuation, the present value of that property is $\$350,000 \times 7 = \$2,250,000$. On the second basis of valuation from such a dividend, the mine should have \$1,750,000 in reserves that can be extracted and marketed within the next twelve months. From the brokers' present valuation of \$6,000,000, it should have at least \$30,000,000 of ore in reserve by calculation. The difference between an engineering valuation of the mine, and a stock-broking valuation is strikingly and ludicrously apparent.

Two other cases are fully as striking, if not so prominent. In these other cases no dividend has been declared, because no ore has been marketed, and cannot be shipped for months yet, nevertheless one property has a stock valuation of \$550,000 and another of \$650,000. We cannot apply the first method here as there have been no dividends, but from the second method (as both are smelting propositions) there should be at least \$2,750,000 worth of reserves in one and \$3,250,000 worth of reserves in the other, to justify the present quotations.

The inevitable collapse of the present artificial bolstering of some of these mining share values will react against the industry generally, and will keep Canadian capital out of future good mining properties. Therefore we would say to the investor in mining properties—"Apply these rules to your proposed purchase; and although they are not infallible they will certainly indicate to you whether you are purchasing on an investment basis, or whether you are putting money on a gamble, for which (if unsuccessful) you must not blame the industry of mining but your own folly."

An Improved Blanket Table.

By THOMAS WHITE.*

Mechanical concentration may be carried out by hydraulic or pneumatic means. Water is usually preferred where circumstances will permit, although it is a denser medium than air. With the former one has to contend with slimes, with the latter, dust; both of which are objectionable substances. To avoid forming these, ore should not be reduced finer than necessary to free it from the gangue, thus limiting the quantity of finely comminuted ore to be treated, and the number of machines for dealing with it; for a certain bulk of stone has its surface largely increased in proportion to the fineness of its particles, and therefore requires a larger concentrating area.

The specific gravity of different minerals is the quality most largely utilized in concentration; but the shape of the particles is also

*Australasian Institute of Mining Engineers.

an important factor which must be taken into consideration in the treatment of ores.

Machines used for concentration may be stationary or movable. The latter may have a regular forward or rotary movement, or may be given a pulsating, oscillating or shaking motion.

There is little difficulty in concentrating the larger grains of different classes of mineral, for the larger the grain the better will the specific gravity of the mineral act.

For material the size of sand downwards, the resistance of the grain by its friction against an inclined plane is largely relied upon. Such material is generally treated without being sized, but is classified according to weight instead. In this case, the larger particles having a larger area offer greater resistance to the flow of water than the smaller and heavier particles, and are therefore more readily carried away. In treating slimes, adhesion between the particles and water impedes the action resulting from specific gravity, but when once the particle touches the bottom, whether by its own weight or by the motion of the water, it is entangled by the rough material which covers the bottom, or clings to the smoother surfaces. Various collecting mediums have been employed for the bottom of concentrators; some are smooth like wood or rubber, others are rough, such as blankets or wire netting. Smooth surfaces are not good for percussive concentrators when required to save fine, spongy or wiry gold, as the motion tends to keep it in suspension. We have frequently noticed that when blankets are kept well washed, most of the free gold is caught on the first four feet of its length, and that although blankets may not collect such clean pyrites as other forms of concentrators, the blanketings on tables properly attended to contain a high percentage of the free gold in the pulp passed over them.

The ordinary blanket table so commonly seen in Australian battery houses is so well known as hardly to require description, yet for the sake of comparison we must refer to it. The chief objection to the simple inclined table covered with blanket, baize or other rough fabric suitable for collecting fine concentrates, is that it requires the constant attention of a man or boy to wash the material of a fair sized plant, and that if it is not properly looked after it ceases to be an efficient concentrator. Then again should it be necessary to alter the grade of the table it takes a lot of adjusting, and unless well looked after it does not concentrate clean, and loses a quantity of fine pyrites.

In order to overcome such objections, and to increase the duty of blankets, we have made certain improvements which are calculated to materially simplify the working of blanket tables, thus supplying a cheap, simple, effective and easily worked concentrator.

The principle and construction of the machine is best seen by following the accompanying drawings, which show it in plain longitudinal section and end view.

To a light frame (F) are pivoted two narrow tables (T), about nine feet long by twenty two inches broad, on the top of which are stretched blankets or other suitable material held down at the sides by the cleats (C). The tables, each of which is made in three or four sections, are set in the frame in such a manner that when at work they are perfectly level at right angles to the flow of water, but they can be given any desired longitudinal pitch to suit the material under treatment, by means of the right and left hand screws (A) on rods, by which the frame is suspended. One end of the frame is connected with a small eccentric, which causes the frame to vibrate about 200 times per minute. The stroke which may average say three-eighths of an inch, can be easily altered by adjusting the eccentric (E) on the disc (D). When working this machine, the pulp flows from the shoot (S) over the lippit (B) which bridges the space between the shoot and the tables, and thence on to the blankets, until the necessary amount of

concentrates has accumulated, when the tables may be tilted sideways at any angle required, either by hand or automatically; the supply of pulp being cut off by the lippit which alters its position as shown (B), and directs it into a launder (W) leading to a spare table. While tilted the blankets have the concentrates washed off them by jets of water from a pipe (H) into a launder (I) leading to settling tanks. The material thus concentrated by each table or section of same table may be collected in bulk or in different grades as desired. When washed, the table rides back into position, while the lippit connecting the feed shoot and the table swings down automatically, thus turning on the feed water as before. The shaking imparted to the tables keeps the nap of the blanket in motion, and ready to entangle and protect the particles of ore which might pass away over a blanket that had the nap beaten down. At the same time the waves produced help to keep the nap clean, and wash away the lighter particles of gangue. When travelling over an inclined plane, thin currents of pulp tend to run in gutters, and form ridges after traversing in the same straight line for a few feet. The two drops given in the nine feet of length in the improved machine break the line of current before it has time to form gutters and ridges, thereby assisting, together with wave motion caused by the eccentric, to maintain an even flow of pulp over the table. To prevent the concentrates finding their way through the loose texture of the blankets, which would form lumps between them and the table, the blanket may have tarred canvas attached to it on the lower side.

One horse power is equal to the task of driving at least sixty of these improved blanket tables, and the same number may be attended to by two boys. Each pair of tables should treat about four tons per twenty-four hours.

The varying elements in this machine are the angle of pitch given to the table, the length of throw, and the number of thrusts per minute, to which may be added the quantity of water applied with the pulp and the rate of flow. Each class of stone, depending on the nature of its component minerals and the size of grain, requires that the tables be set in a particular way in order to give the best result. What this way is, within certain limits, must be found by experiment, and when found should not be disturbed unless a change takes place in the ore. To maintain a regular motion, it is advisable in this, as in all movable concentrators, to have a special motion, for if one be employed which drives a battery or other machinery that is not regular in its use of power, any temporary excess of power is distributed over the rest of the machinery, including that for concentrating, thus diminishing its maximum of work.

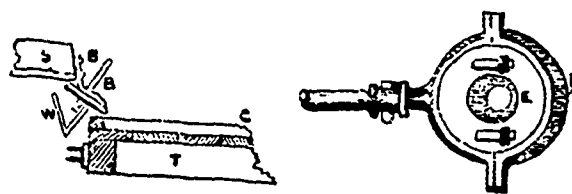
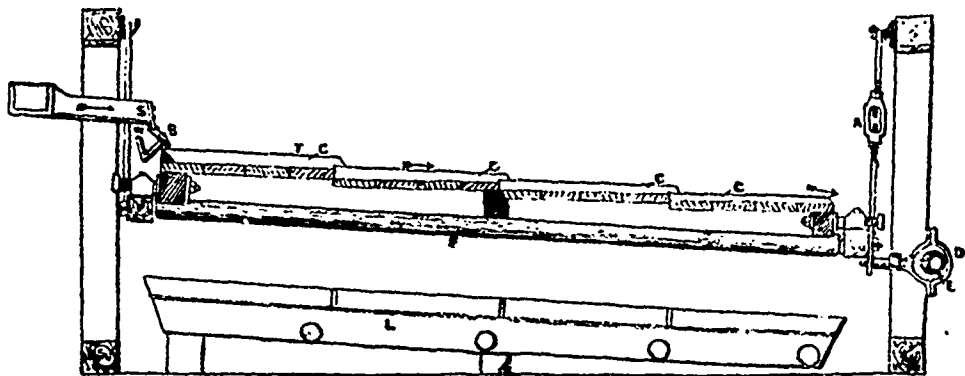
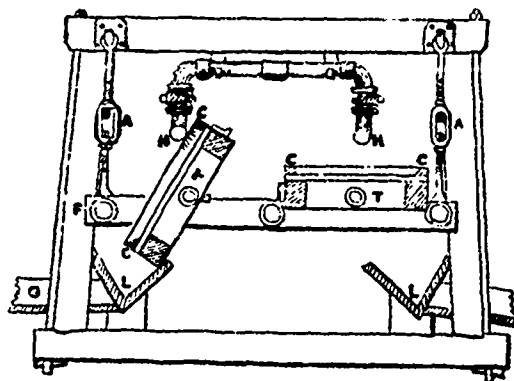
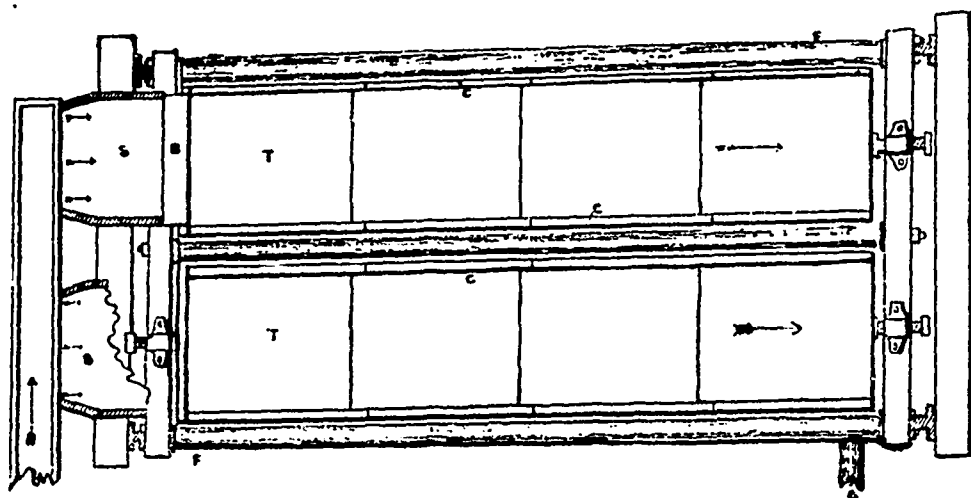
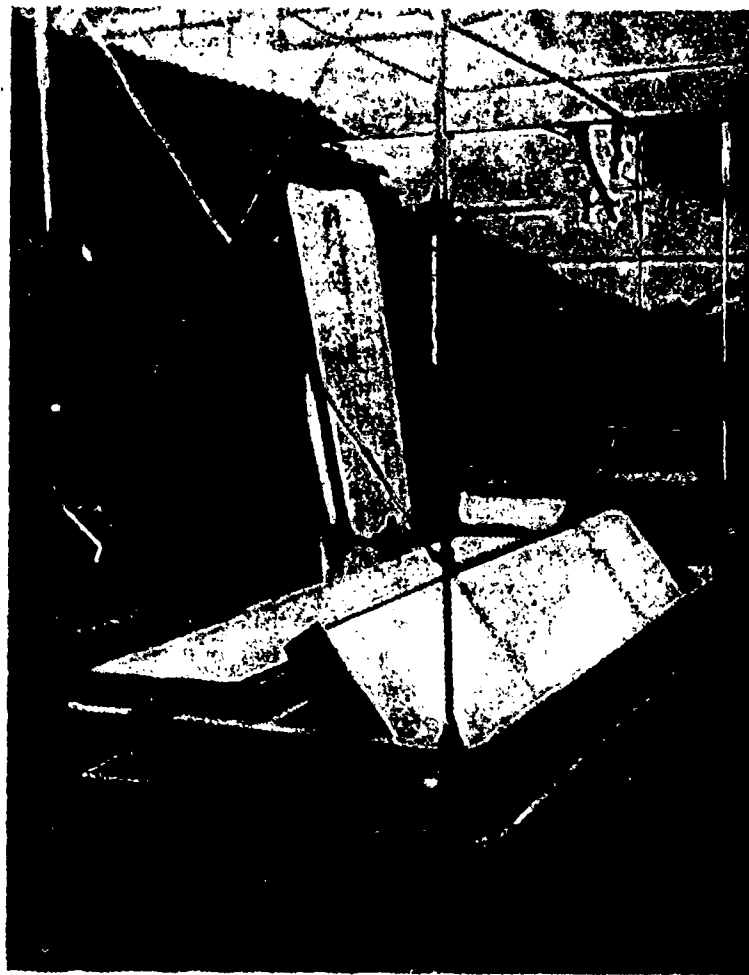
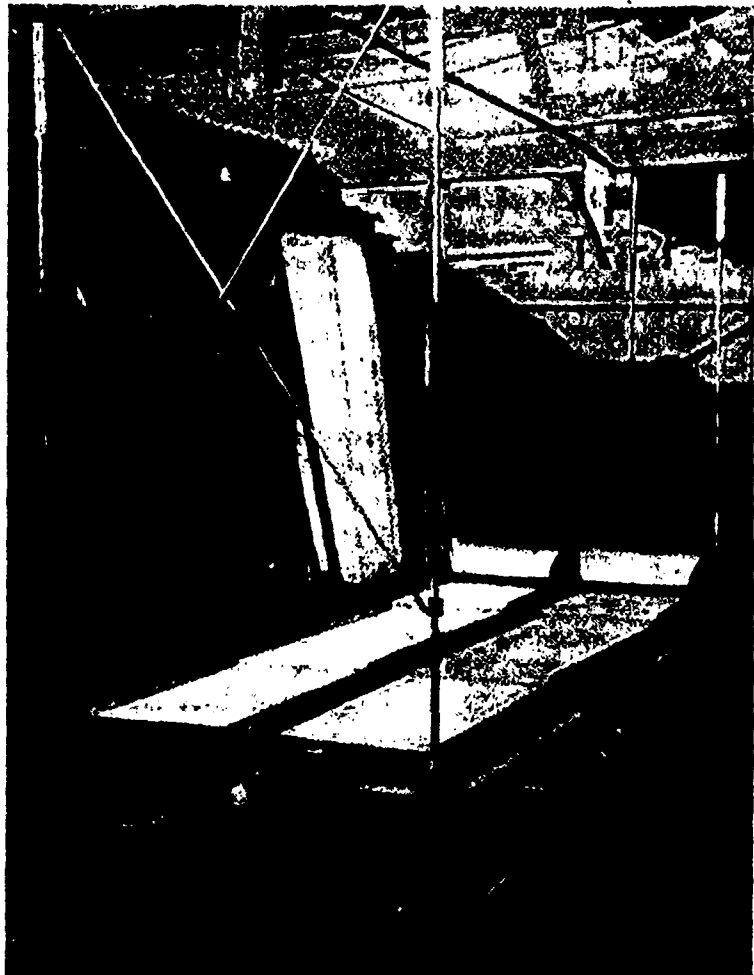
This concentrator is cheap and effective, light in weight, (being only six hundredweight, the heaviest part weighing about 150 lbs.), simple in construction, is subject to very little friction or wear and tear, and is easily manipulated.

DISCUSSION.

MR. F. D. POWER, President, said he was personally acquainted with the author, and knew him to be a man well versed in his subject. He not only understood the principles of concentration, but he had had a large experience in carrying them into practice, and paid careful attention to details. In mining machinery, simplicity and strength, as well as effectiveness, was required; something that could be understood and worked by any man of ordinary intelligence, and not an apparatus requiring the constant attention of the inventor to keep it up to the mark. Mr. White appeared to have constructed such a machine.

MR. W. B. GRAY was very much pleased with Mr. White's paper. He had visited Costerfield, Victoria, and had seen the table at work there. It was doing very good work; but he understood that it was not quite a success. The eccentric motion to drive the blanket tables was a very good idea, and he had noticed that it had been introduced

AN IMPROVED BLANKET TABLE.



by Elliott, of Kapunda, South Australia, in his ripple and copper plate table. The side tip for washing the blankets by a hose or brush had been in use for a number of years. He thought it would take a much greater power to drive the tables than Mr. White anticipated. He objected to the side bump in concentrators on account of the "sand corners" formed at the sides of the belt.

MR. H. F. COLLINS agreed as to the valuable features of the Improved Blanket Table just described, but thought that the inventor's estimate of 1 h.p. to drive sixty tables was far too low. With regard to the difficulty of "ridges" or "gutters" forming in the pulp, it should be borne in mind that this was a fault common to all end-bump as well as to fixed tables; in fact, the end-bump rather increased the tendency to form longitudinal ridges. The only radical cure for this particular evil lay in the employment of a side-bump or shake on the principle of a Frue vanner, and he could not help thinking that it would be an improvement to apply the side instead of the end-bump to these tables. Blanket tables, though very good for catching particles of amalgam, "rusty" or coated gold that had escaped amalgamation, and coarse pyrites, were practically useless for catching fine sulphides, which required a smooth surface of india rubber, cement or some similar material to which they could adhere. In reply to Mr. Gray's objection to the side-bump principle, he maintained that, even allowing for three inches loss on each side of a Frue vanner belt, or in extreme cases as much as six inches, the remainder of the belt was so much more effective than a similar area of an end-bump table that, on material at all suited to vanner work, *i.e.*, pulp below 30 mesh, the side-shake vanner would almost invariably give cleaner tailings than any end-shake machines like the "Triumph" or "Embrey." With proper attention the amount of accumulation at the sides or "sand corners" could be kept very low.

MR. J. W. JAFFRAY agreed with Mr. Collins, but had found that "gutters" or "ridges" formed with both end and side shake tables. He thought it was advisable to have something more permanent than blankets for concentrating. He understood that the Woodbury vanner at Hillgrove had been giving very successful results.

MR. A. J. BENSUSAN stated that in erecting Frue vanners in the Northern Territory he had greatly reduced the amount of loss by "sand corners" by paying careful attention to the adjustment of the bearings. Vanners required a great deal of looking after, which, however, was amply repaid by the results.

MR. F. D. POWER said that some of the remarks made were hardly applicable to the machine in question, and as the author was not present to reply to the criticisms, he would take it upon himself to do so. The machine had already been in use on a large scale at Costerfield, Victoria, where they had a difficult auriferous antimonial ore to deal with, and he understood that so far these tables had done better than other apparatus previously employed. Mr. White had, however, to leave Costerfield to accept a more important position before he had time to complete his experiments. In this case, as in many others, a new machine had been placed on its trial with an ore difficult to treat, instead of being employed on a simple ore first, and then working its way up to the refractory ones. It had been suggested that a side-bump would give a better result than the end one employed; but he thought that would not apply in this case, no matter how well it acted in ordinary percussion tables and revolving rubber belts. On Mr. White's table one wished to make use of the nap of the blanket, which could not be done to the full extent, if at the head of the table it was beaten down by heavy concentrates. The machine was constructed for that purpose. It was not claimed that this machine saved everything; but it was a decided improvement on the ordinary fixed blanket table, both in concentrating and in saving labour.

Modern Cupola Practice, With Special Reference to the Discussion of the Physics of Cast-Iron.

By BERTRAND S. SUMMERS, Chicago, Ill.*

The technologist who has devoted much attention to the foundry business will perhaps have noticed that the present scientific development of foundry practice is in a condition similar to that of the steel business some twenty years ago. In many cases chemistry is looked upon with suspicion, and the old cut-and-dry methods are still in vogue, especially in the smaller foundries. The larger works have laboratories and more extensive means for applying science, and have devoted considerable time and attention to the improvement of foundry practice. This is more especially true in the East, although in the West there are numerous firms devoting considerable attention to improving their methods through the application of chemistry to work in the iron foundry.

It is hardly necessary to dwell extensively upon the effects of the different metalloids associated with iron, in pig or cast-iron, in the way they are given in most text-books. The writer has thought proper to consider more particularly new developments in cupola practice, particularly those pertinent to the discussion of the physics of cast-iron. In this connection some new ideas which recent practice has developed will be mentioned, and some results of practical tests along the same line will be described. Yet it has been deemed advisable also, by way of introduction, to outline the effects of the metalloids as they are described in most text-books, without going into detail.

The question is sometimes asked, What is the most important element governing the quality of cast-iron for any particular purpose? It would seem that right here lies the basis for the greatest difference of opinion. Some twenty years or more ago, silicon was regarded by foundrymen as one of their worst enemies; but since the work of Turner and of Keep, silicon has been greatly growing in favor, until one might say that it is regarded in some quarters as the panacea for all evils encountered in the iron foundry. This has led to the founding of a school, the followers of which seem to regard silicon as an all-important element, and it would appear indeed that in some quarters it is regarded as the one element of decisive importance in pig-iron. It is the writer's opinion that graphite is the controlling element in pig-iron, and that a greater success is obtained where this metalloid is governed, than in cases where the silicon only is watched. We are more or less familiar with the well known ideas, that by gauging silicon the exact mixture suitable for any purpose is obtained; it being only necessary to keep the carbon above a certain unknown minimum, and the silicon being determined crudely by shrinkage and other methods. Indeed, we not infrequently encounter specifications in which the silicon is specified, but no mention is made of either graphitic or total carbon.

Silicon.—This, as nearly every one will agree, is a very important element in foundry practice, its most prominent function being that of promoting the formation of graphitic carbon, while it also lowers the saturation point of iron for carbon. The former is the property that concerns the foundry-man almost exclusively; and it is necessary for him to know about how much silicon cast-iron should carry, in order to have the desired properties. Excluding other effects, which will be taken up later, we must always consider what kind of castings are to be made, in order to know what content of silicon to strive for in the casting. It seems fair to say that nothing absolute can be stated regarding this question. Frequently we notice in text-books and journals, that if iron carries this or that percentage of silicon it will have certain properties. This sweeping general proposition the writer cannot accept, being of the opinion that other conditions will affect the content of graphitic carbon as much as, if not more than, the content of silicon. In general,

* Buffalo Meeting, American Institute of Mining Engineers.

if it is desired to make good machinery-castings of close structure, and at the same time so soft that no difficulty will be experienced in tooling them, the silicon should be between 1.50 and 2 per cent., or may even run to 2.25 per cent. It is always wise in these cases to consider the iron used in the mixture. It is well enough to say in a general way that if we have the same chemical composition in cast-iron we will have the same properties, but experience has shown that this is true in a general way only. For example, mixtures in which the chief component is charcoal-iron, show a perceptible difference from those made entirely from coke-iron. The reason for this seems to lie in the different conditions of the carbon, which will be mentioned later.

For light hardware, in which great strength is not a very important item, it is well to run the silicon up even as high as 3 per cent. This practice has several advantages. It tends to make the iron more fluid, so that it will take delicate moulds well, and avoid difficulty or loss due to shrinkage. It is also said to enable the foundry-man to carry more scrap in his mixture. This association, however, is open to serious doubt, as the amount of scrap which a mixture will carry is dependent upon the carbon content of the mixture and the scrap.

As silicon approaches or exceeds 3 per cent., the casting becomes more and more brittle, and it is desirable to keep well within the limit of 3 per cent. in most classes of foundry work. For most foundry purposes, on the other hand, a silicon content below 1.5 per cent. is to be avoided.

As stated above, these rules as to silicon are only true for ordinary foundry mixtures. Special metals, and mixtures containing peculiar irons, are often found to contradict some of the above statements. The figures given, however, are an excellent guide for general practice and will be found applicable in most cases. It will be developed later that there are other influences which affect the iron more than does the content of silicon.

Sulphur.—The good effects of silicon are frequently counteracted by the presence of sulphur, and mysterious troubles encountered in the foundry are not infrequently traceable to this element; the practical foundry-man being, in this respect, usually at the mercy of the pig-iron manufacturer. Most brands of soft iron, both charcoal and coke, are usually considerably below the danger limit in sulphur. Foundry-men, however, are frequently misled by the statement that sulphur need not be considered, as it never occurs in pig-irons in sufficient quantities to affect the results of their work. If analyses are made of drillings from castings that give trouble to foundry-men not possessing means for determining sulphur, the trouble will, in many cases, be traceable to this element. In most instances, sulphur is introduced into the mixture through the ferro-silicon irons used to supply the silicon to the charge. The writer has found well known brands of ferro-silicon containing 0.17 and 0.18 per cent. of sulphur, and in one case 0.34 per cent. If a careful watch is not made of these irons, or if strict specifications are not drawn upon them, it is not infrequent that 0.10 per cent. of sulphur is found. Most furnace-men endeavoring to do so can keep the sulphur below the limit of 0.05 per cent.

Not long ago, the writer was consulted in regard to some faulty castings, and analysis of them showed 0.12 per cent. of sulphur. The iron was full of small cracks radiating in all directions; but they were not perceptible on the surface, and could only be discovered when the castings were struck with a hammer. When this was done, the casting would fall into many pieces, and the fracture would plainly show that the casting had been previously cracked from one-fourth to one-half of its depth, the remainder of the shell being severed by the blow. Furthermore, the casting showed signs which might have been taken as indicating cold-shortness. In all probability, the sulphur had been introduced in this case through the ferro-silicon, as the casting carried a considerable content of silicon. A maximum limit of sulphur for good

foundry practice should be fixed at 0.10 per cent.; but foundry-men should strive to keep it below 0.08 per cent.

Phosphorus.—This element is present to a greater degree than is commonly supposed in most cast-irons. It may be said that for the greater part of foundry work it is an excellent ingredient up to a certain limit. This limit, for most cases, is about 1 per cent. Where great strength and resiliency are desired, the phosphorus should be very much below this point. However, in cases of this kind, it will seldom be noticeable in high graphitic iron, where it is kept below 0.5 per cent. In snap-flask work, phosphorus is a very desirable element to the foundry-men, tending to make the metal fluid and to keep it so. Its effect on strength is not immediately discernible, if the test bar of cast-iron is subjected to a transverse stress. In most cases, if the stress be applied gradually, a high-phosphorus iron will register nearly as high as one of lower content. A severe blow upon the bar, however, will soon make apparent the difference in the irons. It is weakness under sudden shock that phosphorus most distinctly promotes; and for this reason it should be kept low, where this property would be a detriment. Like sulphur, phosphorus occurs in large quantities in the ferro-silicon irons commonly used in foundry mixtures. It may be stated, that most of the common brands of these compounds on the market carry 1 per cent. or more of phosphorus. The writer has known cases in which 7 per cent. silicon-iron carried more than 1.60 per cent. of phosphorus. Of course, this is unknown to most foundry-men not having facilities for analyzing their iron; and in this way phosphorus is frequently introduced into mixtures which never should carry a high percentage of it.

It may be interesting to note here the case of a special semi-steel, mixed by the writer, which carried a trifle more than 0.8 per cent. of phosphorous, graphitic carbon being 1.84 per cent., total carbon 1.97 per cent., and sulphur normal. The bar broke under transverse stress at 3940 pounds. Another one made from the same mixture broke at 3910 pounds. The writer has frequently found bars made of this metal, which carried over 1 per cent. of phosphorous and broke above 3000 pounds. In the case of the 3900-pound bar, the resiliency was considerable, the bar possessing spring and showing a considerable deflection before breaking. It would seem from this that phosphorous is not nearly as much to be feared as is commonly supposed.

Manganese.—Very little has been said of manganese in its relation to general foundry practice. It is, however, an important element in many ways. It will scarcely be noticed in a mixture, up to 0.8 per cent., as far as the ordinary foundry man is concerned. Frequently an excellent casting is found to contain over 1 per cent. of manganese. It is not very long since it was suggested that manganese is a very beneficial element in cast-iron, and it has been asserted by some metallurgists that a considerable content of this element is desirable. The writer's experience with manganese in general practice has not been extensive, but it seems to him that this modern view is to be looked upon with favor. Although it is well known that manganese promotes combined carbon, silicon predominating in the iron would tend to counteract this effect. Manganese, however, has considerable effect on the magnetic properties of the iron, which have been discussed in another paper by the author (*Journal of the Society of Chemical Industry*, December, 1897.)

It is well known that manganese possesses the property of preventing sponginess of the metal, or blow-holes, by reacting with the occluded gases of the metal; and it seems that the modern view is going to work considerable advance in this way. If the foundry man should be able to run sufficient manganese into his mixture, without hardening the metal, to rid the iron of blow-holes or prevent sponginess, manganese will soon be in high favor for general foundry practice. There is reason to believe that this will come to pass at no very distant date. Since the publication of the above mentioned article of the

writer, later studies of the effect of manganese upon the magnetic properties of iron have adduced striking arguments, tending to substantiate the ideas advanced by Mr. R. A. Hadfield, as to the probable existence of a carbide of manganese, which exerts considerable influence on the properties of steel. It would seem, however, that in high carbon irons, particularly in those carrying a considerable proportion of graphite, this effect is somewhat hidden. It is more noticeable as the content of graphitic carbon decreases.

Carbon. The consensus of opinion seems to be that a great deal is yet to be discovered relative to carbon. Anomalies have frequently been encountered in foundry practice which seemed to indicate strongly that a clearer knowledge of the state of the carbon would greatly aid matters. There is no question that graphitic carbon is the softening agent in cast-iron: and, so far as silicon can control this, it is the governing agent. The writer hopes to show, however, that, in many cases, silicon is powerless to effect this change in the state of the carbon. It is doubtful whether the form of carbon, usually called graphite, is always composed of the same variety of carbon. It will be remembered that some five or six years ago, Prof. Ledebur, in an excellent paper on carbon in iron, described four states of this metalloïd. The carbon, in a transition state toward graphite (as we may describe it), he termed graphitic temper-carbon. He also stated that there was no known method of determining this form, and that it was always estimated with the graphite. It is open to question then if, in many cases where we determine graphite, some of it does not represent graphitic temper-carbon.

To digress a trifle, mention may be made here of an old dispute between the practical man and the technologist as to the value of the fracture in determining the quality of pig iron. Probably most technologists will agree that, as a general indication, this practical method is very useful, but very misleading. Some time ago, the writer had an excellent opportunity to observe this. A very open-grained iron was found to contain much less graphite than an iron possessing a fracture of inferior appearance.

S. H. Chauvenet has given some interesting figures, showing that a lower bed fed from the blast furnace is normally always close grained, though it gives practically the same analysis as the rest of the cast; and he shows, further, how obstructions in the tap hole which cause intermediate beds to fill up slowly will make those beds close grained, while, if the lower bed be filled rapidly, it will show an open grain. Finally, if we compare a charcoal iron with a coke iron, it is a well known fact that although the charcoal iron may carry a very much higher percentage of graphitic carbon, it shows a closer and denser fracture, while the coke iron has a very open fracture, the graphite occurring in nests, as it were, and falling to the ground in flakes when the iron is handled. A possible explanation of this might be, that the graphite commonly determined in charcoal iron represents relatively larger proportions of graphitic temper-carbon, while the coke-iron carries a very much smaller percentage. The iron, assimilating the graphitic temper-carbon, makes a close and homogeneous metal, while the graphite tends to open the grain and segregate, thus frequently causing sponginess in the metal. This would seem to explain the reason why charcoal iron makes a denser and more uniform metal when introduced into foundry mixtures, and hence is generally preferable to coke irons. This suggestion is offered tentatively; the writer not being able, as yet, to identify the temper carbon in such irons.

It may not be amiss, in this connection, to cite an incident in the use of the semi-steel mentioned above. This metal possesses a magnetic permeability midway between cast-iron and cast-steel, being a gain of about 50 per cent. over cast-iron. A test bar from a machine, which had showed inferior results, proved the metal to have the same permeability as cast-iron. This being unexplained, an analysis was made of

the bar, with surprising results. The analysis was almost identical with that of a bar which had showed superior results in this direction. The graphitic and total carbon were practically identical. The mixtures were entirely the same, and the metals had been worked in the foundry in the same way, with the exception that different blast pressure had been used. The bar showing the lower results were very open, and showed a dark grained fracture. The bar giving higher results presented a characteristic silvery appearance, and was soft and tough. It was exceedingly dense and turned more like steel, while the former bar turned just as cast-iron would do. The micro-photographs of these two bars showed radical differences, and seemed to confirm the view that these were due to temper carbon. Further, this metal, when properly made, is homogeneous throughout the casting, and the graphitic carbon shows no tendency to segregate. It would seem, from this, that the state of the carbon was the governing factor; and cases such as this have prompted the above suggestion.

In this laboratory an attempt was made to oxidize the temper carbon by prolonged treatment with fuming nitric acid under high temperature, but without avail. This is in accord with previous work along this line. Hopes are entertained that investigations now in progress will yield some method by which temper carbon may be identified and estimated in these irons.

Combined Carbon.—It is usually admitted that combined carbon embraces more than one kind of carbon. This is, to some extent, substantiated by work upon the magnetic permeability of metals relatively high in carbon. However, the present state of the art will not permit much to be said with certainty in this direction. Reference may be made in this connection to recent works of Messrs. Donath and Haissig on silicon irons, in which they cite the fact that a high silicon iron, when analyzed for carbon by ordinary methods, gives about 1.36 per cent. less of carbon than when the drillings are oxidized completely by combustion with lead chromate, or volatilization in chlorine. Lower results were also obtained when the metal was oxidized with chromic and sulphuric acid. This difference, Messrs. Donath and Haissig suggest, is due to some silico carbide. The writer has endeavored to duplicate these results, working on a ferro silicon containing about 7.5 per cent of silicon. The total carbon, obtained by solution in a double chloride and the residue burned in a combustion furnace, was 2.24 per cent. In every case in which the carbon was determined either by direct combustion with lead chromate, or the residue from the chloride treatment burned in a combustion furnace, the results agreed quite closely with those obtained by solution in a double chloride. It is possible, however, that the results obtained by these scientists may be true for ferro silicon higher in silicon; or it may be that the metal used for their experiments was in some respect anomalous.

Relation of Silicon to Graphite.—Having discussed these general relations, let us now endeavor to see what grounds there are for the assumption that silicon is the governing factor in cast-iron. If we have several pieces of cast-iron, made at different dates from practically the same mixture, the analyses of which show practically the same total carbon and a variation in silicon, we have an excellent opportunity to trace the effect of silicon. For example, in the following table, are irons which would seem to show this quite clearly:

TABLE I.—Analyses of Charcoal Iron Castings.

	I.	II.	III.	IV.
Silicon.....	2.20	2.66	2.92	2.41
Graphitic Carbon.....	2.92	2.93	2.77	2.98
Total carbon.....	3.44	3.48	3.41	3.42

The other constituents of these irons are nearly the same, and all of them are controlled as far as possible in foundry practice. They were made from almost identical mixtures, as is clearly indicated by the uniformity of total carbon. It is evident that this table does not support the unqualified assertion that an increase in silicon causes a pro

portional increase in graphite, and the practical rule, based on that theory, that silicon may be blindly added to the foundry mixture, without considering other conditions, in order to increase graphite and soften the iron, is not substantiated. Comparing irons I. and III., we find that although the latter contains 0.72 per cent. more of silicon than the former, the graphite is 0.15 per cent. lower, while the total carbon is practically the same. Obviously this increase in silicon has not produced graphite, yet the total carbon indicates that there was no marked difference in burden.

Taking IV. as the second in the series, we see that silicon increases by about 0.20 per cent., yet that the graphite is nearly constant, except as to III., which is both highest in silicon and lowest in graphite. The fair deduction seems to be, either that silicon has no marked effect upon graphite in ordinary foundry practice, or that there are other conditions more potent. The latter view seems the more probable.

The above analyses are taken from a vast number made in the course of practice, which confirm this conclusion. Daily records for months show conclusively that the silicon varying between 2 and 3 per cent. has not nearly the effect on the graphite that it is usually supposed to produce. No relation apparently exists between the change of silicon and the content of graphite within these limits, and there is little if any doubt, if we can judge from this long series of tests, that there are other influences in cupola practice which are more potent than the variation in silicon. The above table has been selected as most clearly setting forth this view.

Another proof of this proposition is seen in the analyses of pig iron, before they are introduced into the cupola. Pig iron shows the effects of the metalloids in the blast furnace, instead of in the cupola; yet even in the blast furnace, with its high temperature, the silicon is not always able to govern the graphite. For example, the following are strong indications in this direction:

TABLE II.—Analyses of Pig Irons.

	I.	II.	III.	IV.
Silicon.....	7.94	7.43	3.36	3.30
Sulphur.....	0.041	0.029	0.051	
Phosphorous.....	1.39	1.05	0.606	
Graphitic carbon.....	2.02	1.95	3.31	3.26
Total carbon.....	2.24	2.19	3.33	3.37

Here it appears that the irons carrying more than 7 per cent. of silicon have less graphite in proportion to the total carbon than the one containing 3.36 per cent. Number III., however, is a remarkable iron, and one that is seldom seen, although its high proportion of graphite to total carbon is quite characteristic of the brand, and has been found in most shipments received from this furnace. This anomaly must therefore be due to local conditions.

The castings in Table I. were all compounded from high graphitic charcoal iron. In coke iron mixtures the failure of silicon to increase the percentage of graphite is even more marked. The following analyses are taken from casts made entirely from coke irons:

TABLE III.—Analyses of Cast Iron Castings.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
Silicon.....	2.85	3.76	2.62	2.47	3.18	3.11	2.79	2.95
Sulphur.....	0.073	0.083	0.074	...	...	...	...	...
Phosphorous.....	0.557	0.612	0.469	...	...	...	...	...
Manganese.....	0.39	0.260	0.42	...	...	...	...	...
Graphitic carbon.....	3.13	3.05	3.17	2.55	2.69	2.78	2.67	2.61
Combined ".....	0.18	0.24	0.08	0.74	0.51	0.62	0.54	0.60
Total carbon.....	3.31	3.29	3.25	3.29	3.20	3.20	3.21	3.21

The first four members of this table have about the same total carbon, and were made from the same irons, with but minor changes in the burdening. It is readily discernible from these irons that little if any relationship can be traced between the silicon and graphitic carbon. As in the case of the first four, these mixtures were compounded from the same irons with but minor changes in the burdening.

That temperature controls the effect of silicon is shown when a close examination is made of different shipments of the same brand of

pig iron, the blast furnace running on the same ore mixture. A case came under my personal observation recently, in which the graphitic carbon ran from 3.40 to 3.50 per cent., the silicon remaining in the neighborhood of 1.5 per cent.; but when the silicon rose to 1.3 or 2 per cent., the graphitic carbon rose above 3.50 per cent. In nearly every case of this kind a decrease in the total carbon was likewise noticed. This has also been frequently noticed with other brands of iron, and it is more apparent with charcoal irons than with coke. The heat in the blast furnace seems to be great enough to make the silicon a more important factor.

It is hardly legitimate to attribute these differences to the effect of the other elements, as a glance at the tables will show that they do not vary enough to enter into the consideration. It would seem, on careful consideration, that the effect of silicon is largely governed by the temperature at which it is allowed to act. It is doubtful if the necessary temperature is obtained in the cupola to permit the silicon to have a very strong effect upon the carbon, where its contents does not vary beyond certain limits. It also seems probable that, where the burden is light, the effect is not as marked as in the case of large burdens, where more heat is developed.

Influence of Coke Ratio.—Frequently one hears among foundry men that this or that one uses certain fuel ratios, but it is seldom stated under what conditions the melt is made. One foundry man is melting iron with a ratio of one to thirteen, while his neighbor is running a ratio of one to seven. This means almost nothing, unless the amount of iron melted and the condition of the material into the cupola are taken into consideration. It need scarcely be said that the foundry man who melts 60 tons per day can make a better showing in relation to fuel consumption than one who melts 5 tons, and has the same iron poured from his cupola. The foundry having a smaller burden uses more coke on his bed in proportion to the iron melted. It is also evident that, where it is desired to melt large pigs and large sized scrap, a greater coke-consumption is necessary, to tap the same iron from the cupola. Barring these two conditions, which are evident to every one, the iron is, within certain limits, softer when more coke is used. If analysis is made of metals cast with different coke consumption and practically the same burden, as a general rule, the one melted with the higher coke consumption, up to a certain limit, will contain the most graphite. This is only true when the cupola is run on a coke consumption below what is really necessary to pour iron of a high temperature, and this, again, is largely dependent upon the blast; but where little attention is devoted to the blast, and especially where the blast pressure is below what it really should be, an increased coke burden will often have a beneficial effect upon irons, if too much is not added. If a foundry man is running his blast judiciously and the coke ratio is figured for the best economy, little can be gained from an increased coke consumption.

Influence of Oxidized Material, Especially Rusty Scrap, upon Mixtures.—Little attention has been paid to the peculiar effect of introducing rusty material into the cupola. Only one experience of this kind is necessary to convince a foundry-man of the deleterious effect of corroded scrap. The surface-rust on pig-iron is usually not noticeable, but where corrosion has taken place to any considerable depth, a very bad effect is quickly discovered. This is particularly true where light scrap is used, and a large surface has been exposed to the corrosive effect of the atmosphere, in proportion to the small volume. A prominent effect in bad cases of this kind is to make the iron exceedingly dirty and spongy, and when this dirt is noticeable, the cleaner the material introduced into the cupola, the cleaner will be the casting obtained. The writer was confronted some time ago with a serious complaint of dirt in the iron, and on investigating the case, found it due entirely to light scrap which had been seriously corroded. Upon the dropping of this scrap from the mixture, the trouble entirely disappeared. There is very

little doubt that, in many cases, spongy iron poured from the cupola is traceable to the use of corroded material. Besides this inconvenience, material of this nature tends to harden the iron to a limited extent. But this is not nearly as noticeable as the former effect, and cannot be detected in iron high in graphitic carbon.

Effect of the Blast.—There is scarcely any one factor in cupola practice deserving of more close and constant attention than the blast. There are reasons to believe it exerts considerable influence in furthering the mutual relations of the different elements in the metal, but this has not been clearly demonstrated in the tests thus far made. Aside from its effect in this way, increase of blast seems to have a decided tendency to increase the total carbon in the cast-iron, and correspondingly to increase the percentage of graphite. As demonstration of this, the composition of the irons in the following table, which were made from the same mixture at different dates, may be interesting:

TABLE IV.—Analyses of Castings from the Same Mixture.

	I.	II.	III.	IV.	V.	VI.	VII.
Silicon	2.30	2.74	2.03	2.27	2.04	2.10	2.21
Graphitic carb.	2.98	2.59	2.98	3.07	2.90	3.11	3.06
Total	3.44	3.15	3.67	3.52	3.61	3.74	3.63
Lbs. of iron per lb. of coke..	6.4	5.4	6.2	6.3	7.6	7.6	7.0

The first three members of this series were cast from a larger cupola than the remaining members. Only the third iron shows a high carbon content that compares with the last three. The blast apparently varies. Iron is sometimes poured, which can only be accounted for in this way. If II. is contrasted with I. and III., a decided difference is noticed, also III. differs considerably from I. and II. These irons are all made from practically the same mixture, and are here mentioned to show the anomalies that are so common in foundry practice. Unfortunately, reliable measurements have not been secured on blast pressure, but, inasmuch as the air is supplied by an open blower, the amount of air passed through the cupola would be largely dependent upon the resistance found in the cupola itself. The true criterion of the effect of the blast is the amount of air passed through the cupola in a given time, and not the blast pressure. Whenever an attempt was made to measure the blast pressure, it was always found to be practically the same, even when both cupolas were run at once. The explanation of this is obvious. Inasmuch as the fan is not entirely closed, the pressure can never exceed a certain maximum, or air will be forced back through the fan. In the case here cited, the fan was somewhat overworked, and probably air was being forced back through it. It would thus happen that, if the burden offered more resistance at one time than at another, less air would pass through the cupola at that time. This would seem to be the explanation of the difference in these three irons made from the same cupola.

This hypothesis is apparently verified when the remaining four members of this series are considered. These four irons are compounded from the same pig-irons as the first three, as are also all the irons in Table I. The mixture has been varied but slightly, and if any difference could be expected from this cause, the irons in Table I. should show higher carbon contents than those of Table IV. The last four irons of Table IV. were melted in the same cupola as those of Table I., but more air was passed through the cupola in the former case. Also more air was passed through the cupola in melting the last three members of Table IV. than in melting No. IV. of this Table. This was accomplished by using more tuyere openings. In the case of iron IV., two openings in the upper set of tuyeres were used, besides the full lower set. But with the last three irons of this series the full upper, with the full lower set, was used. With the irons of Table I., only the lower set was used. Contrasting iron IV. with those of Table I., a higher content of total carbon is noticed, and also a corresponding rise in the graphitic carbon. Again, comparing members V., VI. and VII. with IV., the same thing is noticed. This is particularly noticeable in VI., and is probably due to the causes mentioned above. These tables do not

appear to demonstrate that silicon has had any greater effect in promoting graphite under the effect of the increased blast. It may be that if the blast pressure were increased to a still greater extent, an effect would be noticeable. It would seem almost a demonstrated fact that the temperature is the governing factor of the effect of silicon, and the temperature of the cupola is certainly increased by increased blast, if a certain maximum be not exceeded. This limit is seldom reached in foundry practice, and faulty iron is more frequently due to a scarcity of air than to an excess. The blast is probably one of the most important factors in foundry practice, and many of the mysteries not yet explained may be traced to its door. There is scarcely any doubt that it has a marked effect upon the content of total carbon, and it is not unlikely that when the results of further investigation are known, the amount of air passed through the cupola will be found to condition, to a certain extent, the effect of the metalloids in the iron.

Iron Mixtures and Iron Specifications.—An attempt has been made in the foregoing pages to demonstrate that the desire for silicon has been carried to an extreme. This desire has become a mania in some quarters. If the foregoing tables prove anything, they certainly prove that high silicon irons are, in many cases, a useless luxury. A certain amount of silicon is undoubtedly necessary, but the plan of gauging the value of irons by their content of silicon is but one step in advance of the old fracture method. The carbon is undoubtedly the governing factor in irons, and the most radical advocate of silicon can do nothing with foundry mixtures without a certain carbon content. It seems, then, that total carbon is one of the most important elements to specify in purchasing foundry irons. The writer has yet to meet with an iron too high in carbon to be of excellent use in the foundry. It has been the custom in our practice to specify 3.75 per cent. of total carbon in our No. 1 iron, especially when charcoal-irons are purchased, while a very lenient specification is allowed in silicon, it being, for charcoal-iron, not below 1.50 per cent. The furnace-man is allowed to have silicon about anywhere he wants it as long as he can furnish iron with the necessary carbon. A minimum graphite specification is also inserted in nearly every case. The philosophy of this is obvious from the foregoing pages. In the cupola, comparatively little combined carbon is changed to graphite, and this is especially true when the heats are small, and, consequently, the heat developed is not sufficient to produce any marked change in this direction. This fact can easily be demonstrated in practical work, where frequent analyses are made of daily casts, and the compositions of the irons composing the mixture are known.

In these specifications the minimum is specified, and any variation must be above this limit. This is thoroughly practical, and has been in operation long enough commercially to demonstrate its value. It is difficult to get iron merchants to make carbon determinations, but they will agree to furnish iron under specifications requiring certain minimum limits of total carbon and graphite. Whether the latter is specified or not, there can be no doubt about the necessity of specifying total carbon. Very little attention is paid to silicon in the work, as most of the high-carbon irons will carry sufficient silicon for most classes of work. However, it is often useful to require a certain silicon content in the iron, so as to get sufficient graphite, as the heat of the blast furnace is sufficient to enable the silicon to control the graphite to a great extent. In the best snap-flask work, where a large proportion of charcoal-iron is used in the mixture, 2 per cent. of silicon is found to make elegant castings, and in such mixtures no ferro-silicons are used; but a high-silicon coke-iron, carrying over 3 per cent. of silicon and about the same of graphitic carbon, is used. This gives good results, especially where a high grade of machinery castings and fine snap-flask work are poured from the same mixture. This is further substantiated by analyzing some of the best castings of tools and machines that can be found on the market. Some of the best-known firms making this class of work will

be found to be using this variety of iron. With coke-iron it is well to run the silicon a little higher, although for machinery work it is best not to have it too high.

When trouble is experienced with open or spongy iron, and the trouble cannot be traced to some such cause as rusty scrap, a good procedure is to run the total carbon in the casting as high as possible. This will give a higher content of combined carbon, and at the same time the combined content of total carbon, with the graphite, usually increased slightly in this way, will keep the iron soft. When this is done it is well to consider the content of silicon, and if this is much over 2 per cent. a decrease will be found beneficial.

The Use of Carbon.—As mentioned in the first portion of this paper, silicon is commonly believed to enable a mixture to carry more scrap. This belief is open to serious doubt. It is obvious that if a mixture is running low in carbon, and ferro-silicon is added in greater amounts to enable the mixture to carry more scrap, this procedure will not only fail to enrich the carbon content, but will actually impoverish it. The reason for this lies in the fact that high-silicon iron carries less graphitic and total carbon than a good scrap, and much less than a good cast-iron. For this reason it is evident that when ferro-silicon is added to the burden, it is certain to lower the content of carbon in the cast-iron somewhat. Inasmuch as the iron is dependent upon carbon for its softness, it is open to grave doubt whether, by increasing the silicon, and thereby decreasing the carbon, by adding ferro-silicon, any more scrap can be carried, and the same quality of iron poured from the cupola. The amount of scrap that can be loaded into the cupola without changing the quality of the iron is dependent upon the carbon, and especially upon the graphite. Even if we admit that an increase of silicon can cause an increase of graphite, yet, if there is not sufficient carbon present to be changed into graphite, the graphitic carbon cannot be obtained in the required proportion. Further, when it is doubtful that silicon will cause any appreciable increment in the graphite, it is open to question if the ferro-silicon does not tend to lower the scrap-carrying ability of the mixture.

A high-carbon mixture averaging, for example, 3.10 per cent. graphite, and about 2 per cent. silicon, will carry considerably more scrap than a mixture containing over 3 per cent. silicon, and lower in graphitic carbon, or than a mixture impoverished in total carbon, no matter what the silicon content. This assertion can be proved in practical work, and it would seem that the popular idea to the contrary is based on a fallacy.

The carbon determinations in the foregoing tables were all made by the oxygen combustion method, and the greatest care was exercised to insure accuracy. The determinations have been checked, and the results from the furnaces used, checked with results from other laboratories. In this connection, thanks are due to Mr. E. J. Ericson, whose excellent work in this particular has greatly aided this investigation.

In conclusion, it should be mentioned again that the fan supplying to both of the cupolas employed in this investigation was somewhat overloaded. Therefore, it is possible that foundries supplied with better blast facilities will obtain results different from the above; that a greater effect of the silicon will be noted, and perhaps a greater benefit traced to the use of ferro-silicons. If this should be so, it would only go to demonstrate the effect of the blast in foundry practice. It is hoped that any members who may have noted different effects from those outlined above will make their observations known.

WAR EAGLE REPORT.—Our comment upon the second annual statement submitted to the shareholders this month is held over until our next issue.

*Improvements in Winding Appliances.

(South Wales Institute of Engineers.)

The President said that the next paper for discussion was by Mr. E. M. Hann, on "Improvements in Winding Appliances." He should be glad to hear any remarks on the same.

MR. W. D. WIGHT said Mr. Hann had given them some useful and interesting figures to work upon. He should like him to explain how the increase from 130 to 220, mentioned in page 521, in the number of trams raised per hour was arrived at,—whether it was owing to improved appliances for changing the decks, or whether by increasing the steam pressure from 40 lbs. to 50 lbs., combined with improved appliances for changing decks. In any case it was a splendid increase.

As to the next instance described by the author, it was very interesting to know that by putting on new valves he first of all gained nine seconds in winding, and afterwards, by putting on a balance rope, he gained an additional seven seconds.

As to taking the coal into the cage from both sides of the pit, he agreed with Mr. Hann that it was much better to bring the loaded trams in on one side of the pit and take out the empties on the other, wherever that plan was possible; and it was always possible in laying out a new pit. The drum which Mr. Hann had described was rather a departure from the usual practice. Mr. Hann was content with a small number of revolutions in order to get up the speed of the engine, and he agreed that this was much better than the very large drum, worked out to give a very slow commencement, with a large diameter against them for winding up. Some of the drums in South Wales were of enormous size, and had been carried to an extreme. The power required to get these heavy drums into motion was so great that they more than lost any advantage derived from size. He thought that the winding-drum should be made as small as possible, though not too small for the bending of the rope, and the engines run faster, rather than have the huge drums which they knew of. The drum sketched by Mr. Hann seemed to be in the right direction, but he did not know why he had put the brake in the middle instead of brakes on either side, and allow the two ropes to travel over the same flat part of the drum. In that way, Mr. Hann would reduce the width of the drum and also the weight of it.

The question of scroll drum *versus* balance rope under the cage was one that would always, perhaps, be argued. The balance rope had been very slow in making its appearance in the South Wales district. The great difficulty had been that in very few collieries in South Wales were there proper pumping appliances, managers depending usually upon the winding-engine for raising water. It was a very wrong thing to wind water; it ought to be pumped. It was much better to go to the expense of getting pumps to clear the water, in which event the balance rope would probably be more frequently seen in South Wales.

As to the general question of improvements in winding appliances, Mr. Hann, of course, treated of two subjects essentially,—first, the economy in the engine, and secondly, the quantity of coal to be raised. As to engine economy, there was no doubt that Mr. Hann had taken a proper step in introducing expansion. Yet there was a large number of engines in the district still going without any degree of expansion at all. They were simply choking themselves during the greater part of the wind. Whether the compound engine would be largely adopted in the future was another matter, but he was of the opinion it would be. He believed they would not have simply expansion engines, but expansion compound engines, and in that way would be able to do with fewer boilers than in the past. The interesting question, however,

*This paper was re-produced in a recent issue of the REVIEW.

of how to get coal out of the pit was not, after all, so much a question of the size of engine. Some time ago he tried to find out which collieries had done the best work in winding coal. He learned that the colliery in South Wales which had raised the largest quantity of coal in one year, from one shaft with one engine, was the Albion colliery, with 551,000 tons. Mr. Hann suggested that there was a colliery raising more than that with two engines. He referred to Silksworth colliery, Co. Durham, which raised in its best year 535,000 tons from about 580 yards, with two engines winding out of the same shaft. The Albion beat that record with a single engine. Extending his inquiries a little further, he found that last year, at the Bolsover colliery, in Derbyshire, 598,798 tons of coal were raised in 279 working days from a pit 365 yards deep. He thought that this was very good, beating anything they had in South Wales, but he discovered that at Denaby main colliery there were no fewer than 629,947 tons of coal raised in 281 working days last year, the largest quantity per day being 2,673 tons. The management hoped before long to increase the day output to 3,000 tons. Now, as their collieries got deeper the difficulties increased, and the capital expenditure become greater. Therefore more coal was required to be raised in a given time than had been the case hitherto if the colliery was to pay.

It seemed to him that the whole system of winding coal was wrong. They had a great engine trying to raise half a dozen trams of coal at the same time, almost the whole of its power being expended in getting up speed. They ought to reduce the speed and bring more trams quietly up on a system of endless winding. This would be much more economical, and they would raise a larger quantity of coal. It was only a question of working out the details satisfactorily, to substitute altogether a system of endless winding for that of winding by cages at the end of a rope. He was aware he was not advocating anything new. In Lancashire four collieries had been fitted upon this principle, and although he had not seen them himself he understood they had proved fairly satisfactory. But when they came to deep collieries the necessity became very much greater. It might be urged that he was going to introduce an enormous weight, which would have to be met. Well, take a colliery 600 yards in depth. They wanted an output say of 200 trams per hour, and each tram was 10 cwt., carrying 25 cwt. of coal. Assume they ran their endless rope system of trams in the shaft at the rate of just over two miles an hour, for simplicity's sake. They would then have the trams working at three feet only per second. Now that was speed at which it would be easy, with proper appliances, both to take off and put on the trams at top and bottom. In order to raise 200 trams per hour, the rope would have to travel the length of the shaft six times. Therefore they would have 33½ full trams travelling in the shaft at the same time. There was no need to take account of the weight of the empty side because it would be very much less than the full. Including 10 cwt. for the tram, 25 cwt. for the full, and 25 cwt. for the cage, which would be of the lightest description, and each length of rope supporting these, that would give for each tram say 3 tons, or for the whole of the 33½ exactly 100 tons of dead weight in the shaft on the full side. Now he submitted that 100 tons of dead weight in the shaft was nothing to alarm them in these days of best quality steel; it was a mere nothing to support, and the speed at which it was going was so small that it need not be dreaded at all. Well, this would give an output in ten hours of 2,500 tons, which was more than had been done, with the exception of Denaby Main. If they wanted a little more all that need be done was to put an extra cage or two in the shaft. He should be asked, what about the cost? He replied that it would be distinctly less than the cost of winding the same quantity by existing methods. The horse power of working the endless rope to

raise 2,500 tons in ten hours came to 510 h.p. Suppose they added one-third for friction and resistance, this gave 680 i.h.p. A double 22-inch cylinder engine running at 500 feet per minute, working at 100 lbs. pressure of steam, would do that work perfectly well. Where would they obtain a double 22-inch cylinder engine that would raise 2,500 tons by the present system of winding? They would require more like a 50-inch, and they would save at least £2,000 on the first cost of engine against engine. Their pit-head framing would not cost any more, it need not be anything like so high, and it would be a much simpler affair. Then they would save at least £500 in the cost of engine house, and in boilers another £2,500. Thus he contended that by fitting their colliery with the endless rope arrangement they would save something like £5,000 in engine and boiler, and he was certain that nothing like £5,000 would be required to fit up the shaft arrangement. He threw out this suggestion in the hope that someone would be bold enough and have time at his disposal to go into details and work them out.

MR. S. F. WALKER said he should like to make a very bold suggestion. Mr. Hann seemed rather frightened at the idea of putting a large motor at the bottom of the pit to work the haulage. He claimed that the most economical winding under the present system would be to work the winding gear by means of a pair of electric motors, the current being furnished from a large central station, which should provide current for a great many other machines about the colliery, and possibly other collieries as well. The winding engine, as he understood it, was the most wasteful apparatus it was possible to imagine. They were wasting energy during the whole time, except for the few seconds while the cage was starting from the bottom. Now the electric motor, as he pointed out before, cut off all that waste instantly. In South Wales they were a long way behind the Americans, and even behind Yorkshire. Particulars were published in the Proceedings of the Institute of Civil Engineers, of a plant laid down in Pennsylvania supplying collieries over a radius of five miles. The plant was situate in the centre, there was a certain number of dynamos which worked the winding and the hauling engines, locomotives, coal-cutting machines, and in fact everything about the place. The great feature of the scheme was the great economy effected by the adopted system. One particular instance was cited. There were six coal-cutting machines, each of which was supposed to take 15 h.p. It would take a great deal more in this country. The highest horsepower which was taken during the whole of the day was only 21 h.p. Now this ruled all the way through. There was always some apparatus which was not taking quite as much power as it could or would do under the old plan. On the other hand, any apparatus that did not require the power had it there ready for immediate use. So the whole system was economical. It was a startling proposition to wind by electricity, but he ventured to prophesy that it would come about in time.

The discussion was then adjourned.

ENGLISH LETTER.

24 COLEMAN STREET, LONDON, E.C.,
5th November, 1898.

No one can be surprised to learn that October has witnessed a severe shrinkage in the value of Canadian mining securities. For some time past the B. C. market—which, as you know, takes in all kinds of Canadian mining shares—has been very weak, and this month has seen its feebleness enfeebled by politics and dearer money. The prospects of a war with France, and talk of a 5 per cent. bank rate, quite apart from the absence of any supporting orders on behalf of the public, and renewed efforts on the part of vendors and other holders of large blocks of shares acquired practically in the form of bonuses for services rendered in connection with the formation of the host of new companies which were rushed out in the giddy period between August, 1897, and March, 1898, compelled "the market" to put down prices in self defence. What else could one expect in times like these we are now experiencing? The won-

der is that those who constitute the B.C. market have not long ere this given up their difficult task of trying to make a living out of jobbing in a purely nominal market.

	High'st & Low'st. 1897.	High'st & Low'st. 1898, to Oct. 13.	Price. Oct. 25.	Price. Nov. 5.
British America Corporation.....	.....	23/6-14/6	13/-	13/6
B. C. Development.....	2 3/8-1 1/4	1 1/2-3/8	1/4	1/4
B. C. Association.....	2 1/4-3/8	1 3/4-3/4	1	1
Dawson City Trading.....	.....	1 1/8-3/8	1/4 nom.	1/4 nom.
Fairview.....	1 7/8-1 1/8	1 1/8-3/8	1/4	1/4
Gold Explor. of Canada.....	1 1/4-7/8	1 1/8-3/4	.....	.....
Hall Mines.....	1 1/8-1 1/8	1 1/8-1 1/8	11/16	3/4
Klondyke and Col. Gold.....	1 3/8-1	1 1/2-3/8	3/8	3/8
Klondyke Mining and Transp.....	1 1/8-1 1/8	1 1/8-3/8	.....	nom.
Klondyke, Yukon & Stewart Pioneers	1 1/8-1	1 1/8-3/8	.....	nom.
Lillooet and Fraser River.....	1 1/8-3/8	3/8-1/8	1/8	1/4
London and B. C. Goldfields.....	1 1/8-3/4	1 1/8-1 1/8	1 1/4	1 1/8
Mikado.....	3 1/8-2 1/2	3 1/4-2 1/8	.....	3 1/8
New Golden Twins.....	.....	1 1/8-3/8	1/4 nom.	1/4
New Goldfields of B.C.....	1 1/8-1 1/8	1 1/8-3/8	1/2	5/8
Ontario.....	3s. -2s.	2s. 9d.-3d.	.....	6d.
Ontario Govt. Gold Concessions.....	.....	1 1/4-1 1/8	.....	.....
Regina.....	.....	3/8-1/8	.....	1 1/4
Vancouver Syndicate.....	7 1/4 pm.-1/4 dis.	2 1/2 pm.-1/8 dis.	par.	par.
Tangier.....	.....	1 1/8-3/8	3/4	3/4
Waverley.....	.....	1 1/4-1/2	3/8	3/8
Whitewater.....	.....	1 1/4-1 1/8	.....	1 1/8
Yukon Goldfields.....	.....	1 1/8-1/8	.....	.....

As I have already shown, there has been a very serious fall from recent quotations for Canadian mining shares, but as the premium figures quoted in column No. 1, and also the maximums in column No. 2, were really only selling prices, it matters very little to the public who are holders of the different companies' shares. As a matter of fact, in previous letters you were informed how nominal were these quotations, and that they were merely recorded in order to attract business. This is proved by the rapidity with which they were actually dropped directly sellers appeared. Some day I hope to tell you "how markets are made" in the London Stock Exchange, and how absolutely unreliable are the quotations as recorded by the little instruments which keep the public in touch with what is going on in the Exchange. For the present it must suffice for me to assure your readers that, at the present moment, I verily believe that if a seller of a couple of thousand Dawson City Trading and Transportation shares were to suddenly present himself and offer his holding at 2s. 6d. a piece, he would not find a buyer. The same remark applies to the rest of the Turner-Pooley-Cotton group, and for the matter of that to other shares. The market is not a buyer except at rubbish prices, and the consequence is that the genuine holder for value who is forced to clear out of his stock finds himself at the mercy of those who are masters of the situation.

The most sensational fall of the month was in British America Corporations, partly in sympathy with the invertebrate condition of the London and Globe group—despite the recent reassuring speech of the Marquess of Dufferin and Ava—and partly on the alarming news regarding the present state of the Le Roi deal. At one time 12s. 6d. was reached, and if things do not improve, and a reassuring statement soon issue from the group controlling both the London and Globe and B.A.C. Companies, I for my part shall not be surprised to see the shares fall to 7s. 6d. or 10s. Of course the pronounced weakness of the B.C. leader adversely influenced other shares, and although politics and dear money are no doubt largely responsible for the heavy falls recorded, the feeble state of the market was accentuated by the lack of support to B.A.C.'s. Even London and B.C. Goldfields fell back, although I have heard excellent accounts of this group, and am told to look for better prices; while shares of the B. C. Development, New Golden Twins, Klondyke Bonanza, Fairview order have been quite nominal, and practically unsaleable except upon such drastic terms as those we have already discussed.

There is no doubt that those who initiated the Canadian mining market were a little premature, although their hands were to a very large extent forced by the enormous interest displayed in Klondyke. Nowadays to think is often to act, and it was believed that the keen attention paid by this country and Europe generally to Klondyke would cause a big boom in the early months of 1898 in all classes of Klondyke shares. It was to prepare for this financial "will o' the wisp" that the new section was created. When the boom failed to materialize the market was practically gone, for the dealings in the few British Columbia and Ontario properties, in which there is anything like "a free market," would not keep half a dozen dealers in lurches. Had the Stock Exchange allowed both the Yukon and British Columbia to produce for London absorption say a dozen dividend-paying properties, the public would have been better disposed towards both. As it is they have been landed high and dry with a lot of worthless scrip in wildcat schemes, many of which, if properly exposed, should place their projectors at the disposal of the Public Prosecutor. There are a few really sound companies, which are quietly working their properties regardless of market movements, and no doubt quite a large number of these will, by-and-by, by their excellent results, prove to the public that, despite the wildcatter and swindling promoter, the various Canadian gold-mining districts deserve the hearty support of the European investor.

A report was in circulation here that negotiations were on foot for the consolidation of the Anaconda, the Boston and Montana, and the Montana Ore Purchasing Companies at Butte. This was swiftly contradicted in specific terms by the well informed New York *Engineering and Mining Journal*, but it is worth mentioning that the paper which set the rumor afloat in that city has an advertisement in its columns of Mr. F. Aug. Heinze's Ore Purchasing and Smelting Co. This announcement has only recently made its appearance in our contemporary's columns.

Excellent progress is, I learn, being made in connection with the proposed Mining Exhibition at Earl's Court next year. It is true Canada has not yet made up her mind whether she will be definitely represented, but I should think that there is no doubt about her ultimate decision. Possibly the recent correspondence between the Secretary of the London Chamber of Mines (Incorporated) and the Canadian Mining Institute, etc., will assist an early decision. The report that British Columbia had announced that she was too poor to send an exhibit has caused a good deal of surprise, and if the Dominion Government was to refuse to be represented, English investors would consider that there was a good deal of truth in the charges recently brought against Canadians of being excessively economical at a time when a little judicious advertisement would do her "all the good in the world." The following information has been supplied to me by the officials of the Institution which is responsible for the arrangement of the mining portion of next year's Greater Britain Exhibition, and will

doubtless be of much interest to those of your readers who intend to be represented either personally or by deputy:—

"The Council of the Chamber are glad to announce that though the Mining Exhibition, in connection with the Greater Britain Exhibition at Earl's Court next year, is yet seven months ahead, over three-fourths of the space in the Mining Courts is already allotted. Whatever may be the views held in certain quarters of past Exhibitions at Earl's Court, those who are acquainted with the progress of the present movement are quite satisfied that next year's Exhibition will be a splendid success, of great practical benefit to the colonies, to mining companies and investors, and a crowning credit to those responsible for the undertaking. In order that the importance and widely representative character of the Exhibition may be properly understood, it should be known that the following Governments will be officially represented as follows:—Queensland, 30,000 square feet; Victoria, 25,000 square feet; Western Australia (per the West Australian Chamber of Mines), 19,000 square feet; and New South Wales—exact area not yet to hand. Very satisfactory—though not official—assurances have come to hand to the effect that Canada, New Zealand, the Indian, South African and Witwatersrand Mines will also be largely represented. It is, however, in the region of mining machinery that the Council are confident of making the Exhibition one of great practical utility to the directors and mining agents resident in this country, and representing many thousands of working mines in various parts of the world. With this end in view, the Council have extended the time in which to make application for mining machinery exhibits until late next month (November). Already many of the largest manufacturers in this country and the States have sent in applications, two of the largest in this country showing working machinery covering upwards of 1,000 square feet. Already the Council are giving their attention to the medals and diplomas to be awarded the machinery exhibits.

In this country many people recognize that soundly managed Canadian smelting companies should prove profitable, and several schemes have been initiated which include in their programme proposals dealing with this industry. One of the most important smelting propositions which has yet come under my notice is that of the Vancouver Smelting Co., Limited, which, with a capital of £300,000, "intends to purchase a smelter and establish extensive metallurgical works for the treatment of ores, at or near Burrard Inlet near Vancouver, in the Province of British Columbia, and to acquire the following properties and rights if considered desirable: The vendor makes over to the company a modern smelter, in working order, capable of smelting about 100 tons per day of 24 hours, together with an efficient ore sampling plant, assay plant and laboratory, and good substantial docks and wharves for the proper reception, handling and delivering of ores at the works. A freehold site of about 40 acres on the south of Burrard Inlet, east of and adjoining the township of Vancouver and marching with the Canadian Pacific Railway. The entire benefit of a contract with Messrs. Treat and Blewitt for the supply of 60 tons of ore per diem on very favorable terms (see paragraph 'Profit')." The company also acquires certain options on various mineral properties, none of which have much of a reputation on this side. The proposed directorate includes: Colonel B. H. Martindale, C.B. (Chairman), Director of the City of London Electric Lighting Co., Limited, and St. Katherine's Docks, London; Sir Henry Cunningham, K.C.S.J., Director of the Investment Trust Corporation, Limited, and American Investment Trust Corporation; Sir Charles Turner, K.C.J.E., Director of the Argentine North-Eastern Railway Co., Limited, etc., etc.; Daniel C. Griffith, Esq., Assayer, 19 and 41 New Broad Street, London, E., Chairman Mount Zeaham Silver Lead Mines, Limited (16 years in charge Lead Reduction Works, Erith); G. Mure Ritchie, Esq., St. Vincent Street, Glasgow, Chairman Millorn and Asteam Hematite Iron Co., Limited, Director London and Glasgow Finance, Limited, Consulting Engineer, J. D. Kendall (Messrs. Bewick, Moreing & Co.) Consulting Metallurgical Chemist and Assayer, W. Fellow-Harvey, F.C.S., Vancouver. One of the Solicitors, A. St. G. Hammersley, Solicitor to the Corporation of Vancouver.

Large profits are of course estimated in addition to the £36,000 (gross) which is guaranteed by the terms of the Van Anda contract. The directors have made arrangements whereby they "can secure the services of Mr. Otto Stalman in the erection and management of the metallurgical works, and they will be in a position to smelt and treat ores three months after the conclusion of the purchase." The present issue is £100,000 in £1 preferred share, and 22,500 ordinary shares. Purchase price £130,000 payable £52,500 in cash and £77,500 in fully paid ordinary shares. The vendor it is naively announced is "reselling at a profit in shares only." Mr. Geo. de Wolf, F.G.S., has made a report on the proposition, and the prospectus—an advance one—lying before me includes an underwriting letter and a rough map. So far as I can see after a careful perusal of the prospectus there is not a line to indicate that the promoters have secured even the ordinary expert's opinion regarding the value of the property on Burrard Inlet, and the smelter and contracts, etc. As a rule these reports are a farce, but it gives us some one to blame should prospectus anticipations of future profits not be fulfilled. The company has been kept back by political and other considerations, and the prospectus before me is only an advance copy. In the final one, some of the points I have raised in anticipation may be found adjusted.

The English press continues to pay keen attention to everything Canadian, and it can certainly never be laid to the charge of our newspaper men that they have not fostered in every possible way the growth of public interest on this side in the possibilities, mining and commercial, presented by the Dominion. In proof of this let me cite a few of the head lines of short articles upon Canadian matters which appeared in one of our financial daily papers one day in October:

- "Klondyke Corruption."
- "English Capital in Canada."
- "LeRoi Prospects."
- "The Telegraph to Dawson City."
- "The Deepest Mine in Ontario."

Canada may indeed feel well pleased with herself over the interest she has already aroused in the old country.

We have heard very little of late about the north-west Ontario goldfields, but if all I hear be true efforts are about to be made to revive public interest in a district which has been almost totally eclipsed by British Columbia and the Klondyke. The following extract from a leading financial newspaper shows that on this side we are not wholly unmindful of the possibilities before the Lake of the Woods district:—

"After what the Canadian newspapers call 'a lull in the boom talk,' during which a lot of development work has been accomplished, the Lake of the Woods goldfields are again coming to the front. Rat Portage and Duluth advices show that a good deal of English and American money and energy is being put into that country, and the prospects seem to be that good returns will be obtained. Good work, on an extensive scale, is being done. The local interest in these fields is fully shared in London (?). They are the nearest of our colonial gold fields. Shareholders in the mines of the district can see their property in the course of a short summer holiday,

and the occasional calls of intelligent shareholders would probably have anything but a slackening effect on the management of the mine."

I must comment on the paragraph which I have queried. If the local interest in the Lake of the Woods district "is fully shared in London" then all I can say is that they are poor supporters, for although there are certain groups here interested in Ontario, and ready to supply it with funds, Canadian gold mining is best known to the public by means of the sensational Klondyke, and the more (vicariously) pushing Pacific province. But although we are as I have already said "not unmindful of the mineral possibilities of Ontario," there has never been any of that white heat about this province that a year ago evinced in the Klondyke and in a lesser degree should B.C., both the latter and the former having been splendidly pulled by the good, bad and intelligent promoting groups which showed such eagerness to use them as the mediums for extracting thousands of bright British sovereigns from the pockets of the gullible British investor. If Ontario can prove by deeds what her friends say of her is true then she need not particularly lament because she has been so far neglected by the London promoting fraternity, a heterogeneous community which includes some of the most respected financiers in the country, and most of the scum of Europe. London's financial flotsam and jetsam would furnish an interesting chapter in any of the *in de steele* works on contemporary finance.

C. J. W.

LAKE OF THE WOODS.

Navigation is just closing. Nearly all the steamers are laid up, and in a few days at the furthest the Lake of the Woods will be frozen over, and communications, except along the C. P. Ry., interrupted until the ice is strong enough to carry teams. During the closing month of the shipping season all the boats were busy carrying supplies to the various camps, and stocking them with sufficient to last until the time when the sleighs will run. There was quite a little famine for hay in Rat Portage towards the end of October, notwithstanding the fact that we are so near the western prairies. For a week or ten days there was not a bale to be had in town, and for a while there were no oats either. At some of the mining camps horses were being fed on bread, potatoes, etc. I may say *en passant* that hay, oats, meats, vegetables, butter, cheese, milk, eggs, poultry, etc., are always a good price here, and there should be good money to farmers who would settle here and supply this market—a market which is destined to be a growing one.

REGINA.

The battery of seven Tremaine mills is working away steadily. Underground sinking has not been resumed since it stopped in the summer when the changes were made in the mill. The Rat Portage Diamond Drill Co. are to do some boring at the 400 ft. level, in order to crosscut some parallel veins. Mr. Pringle having left on a visit to England, Mr. Maiville is in charge of the camp.

WILKINSON.

The Vulcan and Cliff shafts are each down 50 ft. or more, and a crosscut is being driven from the bottom of each shaft to cut a vein in each instance. Good camps have been built, and everything is in readiness for a winter's campaign.

MIKADO.

Mr. Theo. Breidenbach, manager of the Mikado mine, in a letter to the *Financial Post*, of London, England, replying to certain strictures by that journal on something he had to do with the Ontario, Limited, which is reproduced in the *Rat Portage News* of Nov. 12th inst., incidentally makes some interesting remarks on the Mikado veins, and upon mining conditions on Shoal Lake. Mr. Breidenbach says: "I may say that it requires a man with a large geognostic knowledge, and the ability to apply such knowledge practically, to take in hand such a proposition (as that of the Ontario, Limited). It requires many years experience, and close attention to all the ins and outs of every occurrence, and the ability to compare such, in order to follow successfully the peculiar nature of the deposits of the Shoal Lake district. In the Mikado veins I have repeatedly found the walls converging to a mere nothing without the smallest leader to be guided by, and after crosscutting a few feet, either into the hanging or foot wall, again encountered the vein in all its former width and splendor. There are 'horses' of granite in the vein, and bodies of chloritic schist running outside the walls of the vein, slightly altered by silicious infiltration, which run as high as 18 dwts. per ton. The Mikado vein No. 2 starts at the surface in granite with a width of three inches, and at a depth of 150 feet the vein, crossing trap, shows a width of at least eight feet, consisting of silicified slate carrying a value of 15 dwts. The veins go down, but not in the exact lines that one could wish. With depth the line is frequently broken, but the deposit and the gold are there all the same. In order to find it you must search for it carefully, but it needs a man of experience and sound common sense, with his heart in his work. As to the Mikado mine, it can stand any competent inspection, and few mines of its age can show such a large amount of development work done. Since the mine was ten months old it has kept a 20-stamp mill running, whilst the existence of ore now proved is sufficient to feed that mill for 25 years to come."

BOULDER.

It was expected that the compressor plant would be started up on 16th Nov. Captain J. R. Gifford, reputed to be an experienced mining man, is reported to have said that he will put the shaft down 500 ft. before calling a halt.

VIRGINIA.

Messrs Stifel and Brockunier, owner and manager, respectively, have gone to their home in Wheeling, West Virginia. Mr Brockunier will return about the middle of December. A hoisting and pumping plant has been ordered for the property and will go in over the ice. Sinking will go on all winter. It appears that the rich stuff which has been taken out came from a shaft, now down 12 ft. or more, sunk at the junction of a heavy leader with the main vein. This leader or branch vein is 3 ft. wide and the gangue is largely a chloritic schist. The tunnel is on the main vein.

PIPESTONE.

A small camp has been put up on this property—McA. 154 and 155—in readiness for winter operations should such be decided upon.

BURLEY.

The shaft is now down about 110 ft. below lake level. As might be expected, it makes a good deal of water.

BAD MINE.

A new deal is on foot between the owners and Mr. Hugh Armstrong, of the Norman Fish Co., Mr. Hildreth, formerly of Mine Centre, and Mr. Peters, the amalgamator and millman. The amount of the option is said to be \$20,000.00, with 10 per cent. cash down. A Tremaine mill is spoken of.

ENGLEBUE CONCESSIONS.

All operations suspended on both of these.

RAINY RIVER GOLD MINING CO.

Good progress is being made with the prospecting work on the Wimor mine locations, a short distance east of Rat Portage. The vein at No. 1 shaft is improving with depth and the values are said to be good. Test pits are being sunk on other veins from which some good showings have been obtained.

STELLA.

Work stopped early in November, on account of a depleted treasury, it is understood; there is no one about the place at present. On the Stella vein the shaft is now down 125 ft., and the character of the vein had begun to improve, the footwall showing a tendency to declare itself more definitely. The hanging wall is well-defined, with a layer of gouge between it and the gangue mass. The percentage of quartz in the gangue is on the increase evidently, and the vein is about 6 ft. wide. It is unfortunate that operations should have to be suspended at this juncture when there was such strong encouragement to continue the sinking. The mill run of 150 tons at the Keewatin Reduction Works was rather disappointing to the Stella people, as the yield of gold was only about \$500.00, or hardly \$3.50 per ton. But it appears that a considerable portion of the lot treated was the slaty stuff from the Stella shaft.

MCA. 130 AND 134.

Mr. Beck, representing Mr. Thornton, of Glasgow, Scotland, has taken a three-months option on these two locations; they are situated immediately west of the Triggs property in the Gubi Lake country. Camps are now being built and development will commence at once. Mr. McKenzie, a native of New Brunswick, a miner and mechanical engineer, will have charge of the mining crew.

CAMERON ISLAND.

Closed down until toward spring, when a power drilling plant will be put in. The two men with the team left at the mine will get out some cordwood during the winter.

TORONTO AND WESTERN.

The management are about to let a contract for sinking 100 ft. in the shaft on D 410, which is close to the Mikado property; the shaft is 100 ft. deep already. Mr. Moore, the manager of the company, and Mr. Peter McKellar, the engineer, returned from a trip to the properties yesterday.

SENTINEL.

Operations were resumed at No. 1 shaft towards the end of October, when a shaft house was built which will also afford room for a blacksmith shop; a collar of good workmanship put in to the requisite depth, with the ladders required. A hand-power pump and a Denver horse whim have gone out to the property. Sinking started again about Nov. 2nd. The crew numbers eight men with H. Provdlock in charge.

THE TYCOON.

This is the name of a new property which has been prospected with the diamond drill during the past season. It comprises three islands in Bag Bay, Shoal Lake, near the Mikado mine. A vein said to be 30 ft. wide has been located, carrying good values in gold. The owners have been organized under the name of the Tycoon Gold Mining Company, with a capital of \$150,000.00, and a charter has been obtained.

WINNIPEG AND SOUTHEASTERN RAILWAY.

It has been decided to take this road south of the Lake of the Woods, and on November 10th the steamer "Keenora" left for Fort Frances, having on board an engineering party who are to go on with the location of the line. One of the party was Mr. Malcolm Macfarlane, C.E., of Almonte, Ont., who has had considerable experience in railroad and general engineering, both in the States and the Dominion, and was latterly for a term of two years on the U. S. Geological Survey in the Rocky Mountains and west.

The location of this railway south of the Lake of the Woods, instead of crossing at French Narrows, the alternative route, is to be deplored from a mining standpoint. Although the road may re-enter Canada at some point along Rainy River, yet it will be of no practical advantage to the large tract of country lying between Rainy Lake and the Manitoba boundary, whereas had the road crossed at the Narrows of the Lake of the Woods, the region just indicated would have been greatly benefited. It would have greatly assisted and stimulated the opening up of the region of the Regina Mine, Surgeon and Deer Lakes, Camp Bay, Crow Lake, the Pipestone Lake and lakes between it and the Lower Manitou. The road would then also have been a competing line with the C. P. Ry. for the country from Fort Frances and the Manitou westward. No doubt the route south of the Lake presents fewer engineering difficulties.

Mr. Allan Sullivan, C.E., and Mr. A. M. Hay, of the Dominion Gold Mining and Reduction Co., have gone to England on business.

Dr. Keenan, a mining expert who has had experience in South Africa among other fields, is making a visit to the Lake of the Woods, and has been down to the Manitou also.

J. M.

RAT PORTAGE, Nov. 17th, 1898.

NOVA SCOTIA GOLD MINES.

A new lead has been discovered at Hurricane Point, Isaac's Harbor, which bids fair to exceed the Palgrave, the quartz encountered so far being very rich with heavy gold. Scarcely enough development work has been done yet to determine what the real character of the new lead may be. The Palgrave is looking well, and yielded for last month 165 ozs. of gold.

The Richardson yielded 185 ozs. for October, notwithstanding 10 of the 40 stamps were hung up for repairs during the month. Development work in this mine has proved the lead to form a complete ox-horn or hair-pin shape, the head or circular

end lying to the east, where it is found to lie 18 ft. thick at the axis and dipping easterly at an angle of 35°. The legs or extremities run nearly east and west, and dip the one south and the other north, and are 150 ft. or more apart. No exploratory work has yet been done crossing the anticlinal folds between these two Richardson vein extremities.

Senator Snowball, of Chatham, F. J. Black, of Sackville, F. P. Thompson and Walter Kichner of Fredericton, N.B., have bought 57 per cent. of the Modstock mine stock, the most of the original owners, who all live in Antigonish, holding a portion of their stock. The amount paid by the N.B. men is \$22,800. This mine has been for a long time a steady and profitable producer, which is largely attributable to the excellent management of W. J. McIntosh, who has with skill and economy served his company well. We predict and trust the mine may continue to prove as profitable to its new owners as it has in the past to its old.

Goldenville.—The Blue Nose and New Glasgow combined produced last month 365 ozs. The ore is now all milled in the Blue Nose mill, and the 20 stamps are in commission full time day shift.

The Montreal-London Gold and Silver Dev. Co., it is reported, have purchased the Lake Eagle property, adjoining the Dufferin on the east, in which we think they acted wisely. This company now run the largest gold mining property in the Province. The new mill is nearing completion, and the underground development work is proving most satisfactory.

The heavy ore belt recently encountered at a depth of 500 ft. on the Guffey Jennings mine, Caribou, is said to be looking exceeding well. Not a little interest is felt in the success of the development of this old Lake Lode mine.

New machinery has been added to the Elk mine plant since its acquisition by Mr. Getchell and we hope very soon to hear of this mine again making satisfactory returns.

John H. Anderson has recently sold a portion of his areas at Lake Catcha, on which he has recently completed a 10 stamp mill. His last clean-up was 70 oz. from 100 tons. We are informed J. B. Neily has acquired several properties in this district under bond. Mr. Neily has been remarkably successful of late as a promoter.

Mr. George Rawlings has accepted the management of the Tangier consolidated mines recently sold by J. B. Neily to a Boston syndicate. All the development and test work done on this large aggregation of areas during the progress of negotiations for sale were of the most satisfactory character, some \$15,000 worth of gold being secured during this work.

The J. J. Withrow mine, south of Uniacke, produced for last month 132 ozs. from 122 tons of rock.

The Cashen Hines mine at Millipsgate yielded 76 ozs. Geo. J. Heseler's mine at Gold River gave 36 oz. from 59 tons.

Mr. W. L. Libby's mine at Brookfield returned him 252 ozs.

What is considered a very important find of wolframite has been made in Cape Breton, near Margaree. The vein is in the granite, and is said to be 2½ ft. wide and to contain 65 per cent. of tungstic acid, worth £50 per ton. This is the first discovery of the kind made in Nova Scotia, in fact, we believe, in the Dominion. This rather rare mineral enters largely into the manufacture of the most expensive steel manufactured, the selling price of which is in the vicinity of 40 cents per lb. What makes the find of more importance than otherwise is the fact that in close proximity are large deposits of red and brown hematite and specular iron ore, and within 60 to 70 miles abundance of coal and limestone. Nature has evidently done her best to make this the centre of activity for the manufacture of iron and steel.

HALIFAX, Nov. 18.

S. G.

NELSON NOTES.

We have not been favored during the past month with any very startling discoveries of enormous ore bodies carrying untold wealth, nor on the other hand has any mine or partly developed prospect ceased working for want of ore; and this latter fact is perhaps the best sign of a thoroughly prosperous mining camp.

Prosperous indeed it seems; if only from the numerous handsome private residences that have been and still are being erected all over the town site, while the large brick and stone business premises that have been built during the past twelve months are a still more substantial proof that Nelson is in a very comfortable financial condition.

The Crow's Nest Pass line is completed to the end of Kootenay Lake, and a very handsome new steamer has been built and launched to accommodate passengers and freight until the rails shall be laid from the present terminus at Kuskonook to Nelson itself, which work the C.P.R. intends to push along with all speed. This line when fully completed will greatly shorten the time now taken up in travelling east from here, it will quite possibly reduce the time of at least 24 hours between Nelson and Winnipeg which will be a great benefit to all this district; and indeed will materially assist in making this town the interior metropolis of British Columbia, the chief distributing centre for all the Boundary Creek district on the west, and the Slokan and Lardeau on the north.

The Boundary Creek district will before long be tapped by the new line now in course of construction between Robson and Penticton, and the large and well proved bodies of copper ore in that locality will be profitably worked by smelters erected

either in the immediate neighborhood or at some other point which the cost of fuel and freight may determine to be more suitable—as it may pay better to transport ore rather than fuel and flux, and practice alone can decide that point. There is abundance of ore there anyhow, and much of it is of a very high grade.

Perhaps however the district that is going ahead most rapidly just at this time, is that to the south of us along the line of the Nelson and Fort Shepherd line, comprising the camps known as the Ymir, Salmo and Erie, in all of which a very great deal of work has been done, and some very fine high grade ore discovered. It is not very easy to select the best among many good properties, but the Dundee mine is certainly doing very well, a recent shipment of 20 tons to the Hall Mines smelter yielding a return of \$50 to the ton. A large concentrator is practically finished at the mine, and with the large reserves of ore in sight that property ought to prove a dividend payer in the very near future.

The Porto Rico is another mine that is looking well, and a 10-stamp mill has been established there, which looks as if the management was satisfied as to the extent and quality of their ore.

In the Erie camp, the Second Relief is showing up exceedingly well, and a very large amount of development has been done on it. The ore is apparently copper, carrying very considerable gold value part of which seems to be free milling, and it is the intention of the owners to install a stamp mill to save what they can on the plates and ship the tailings to some convenient smelter.

The Arlington mine also is doing nicely and a large amount of machinery has been erected on the property. This ore being amenable to the cyanide method of extraction, an extensive plant will be put in probably next Spring, but in the meantime when there is enough snow, ore will be shipped regularly.

It is a curious thing, but many of the mines in Kootenay cannot profitably ship ore except over the snow, and then what certainly is remarkably inconvenient in towns, is an absolute necessity on the hills, and makes some properties valuable which otherwise would have to be abandoned.

This fact should by no means be lost sight of by mining experts, who know nothing of this extraordinary country—it is within my knowledge that a good property has been condemned by the expert who examined it, on the ground that it "could not be worked in winter"—the fact being that it could only be worked profitably during that season.

Coming nearer home again, we find that the Lemon Creek district (to which a wagon road has been built from Kootenay Lake) is and has been busy this season. The principal mine so far seems to be the Oro, whose owners intend to push development work with all speed. A very complete outfit of machinery for a stamp mill is now on the road, and is waiting for sufficient snow to be hauled the remainder of the way to the mine. A sawmill has already been erected, and this again shows that the owners have confidence in the value of their property.

The Nelson-Pooman is looking well just now, though there is not a very large staff employed upon it. As was stated in previous notes, the lower tunnel has proved the continuity of the ore body; this is now reported to be fully two feet wide and to give an average value of \$30 per ton. This ore also is partly free milling and partly smelting in character, the "tailings" being sent to the Hall Mines smelter.

The Athabasca group is proving worthy of all the praise that has been bestowed upon it; as depth is gained the vein is becoming better defined, quite contradicting the views that some experts held, that the vein would not prove continuous in depth, and showing most decidedly that the owners have a genuine mine, not merely a prospect which might or might not turn out satisfactorily.

An adjoining property, the Exchequer, is also looking better as more work is done upon it, and some think (not unreasonably) that the Athabasca vein may continue through their ground.

The Fern mine has had a very satisfactory clean-up, the value of the shipping ore and what was saved on the plates amounting to some \$9,500 in 33 days run; when the cyanide plant is in full working order the management hope to make a still better showing.

The Hall Mines smelter is working rather irregularly, being blown out as often and as long as it is blown in, and it certainly seems as if there had been a miscalculation of the amount of ore available in the Silver King mine. 250 tons a day is a big output for any mine that has not a regularly defined vein, and it is a well known fact that the valuable ore of the Silver King exists in masses or pockets rather than in a vein; but as however the London managers seem to have "taken a tumble to themselves" (excuse the slang!) and are now insisting on more development being done, there is every hope that this—the pioneer mine of Nelson—will once more occupy its proper position as a source of wealth to the shareholders.

East Kootenay is hardly in the Nelson District, but there are some remarkably good properties showing up there, and the Crow's Nest Pass Railway will immensely facilitate the transportation of the ore to the various smelters. The "St. Marys country," as it is commonly called, appears to be extremely well mineralized, some remarkably fine specimens of both copper ore and high grade galena having been submitted to my examination recently. The North Star is perhaps the oldest mine (not very far from Fort Steele), but there are others, among which the St. Eugene is foremost. With the abundant supply of fuel for smelting now assured, it will be a wonder if smelters are not very soon established in that district. There is, and for some years has been, one at Golden, but to the best of my information it has never been worked; still the enormous impetus to smelting that the now readily available fuel near the Elk river has given may cause that plant to be started, with every prospect of success.

NELSON, 15th Nov.

A. H. HOLDICH.

OUR ROSSLAND LETTER.

ROSSLAND, B.C., November 15.

The question of the cost of mining in Rossland has necessarily always been one of the first importance in this community. Heretofore it has been the general opinion that \$5 per ton represented approximately the lowest costs at which ore could be delivered on board the cars from any of our developed mines. As a matter of fact most of the ore shipped to date from the mines of this camp cost considerably more than that sum, and it is not so long since \$10 would have been considered a low average. For instance, it is quite certain that the ore shipped from the War Eagle before it passed into the hands of the Gooderham Blackstock syndicate, and from the Le Roi until a year or so ago, cost fully that sum.

A cost of over \$5 per ton was, however, so much in excess of the cost in camps similarly situated that it was felt it would sooner or later be reduced, and the future of the camp depended in no small degree on the successful solution of this problem. As is well known the tonnage of \$8 to \$10 ore in Rossland's mines is enormous, and it would be futile to talk of working such ore if the cost of mining were \$5 per ton or anything like it. It was therefore very good news for every citizen of Rossland and everyone interested in its mines when the Le Roi Company published a statement of the cost of mining for the months of September and October. In the former month the mine shipped 10,000 tons of ore at a cost of \$3.18½ per ton on board the cars. In the following month the output was 12,404 tons at a cost of \$2.79 per ton. In estimating the cost for each month every expense of the company was figured against the ore shipped.

SUPERINTENDENT TREGEAR'S VIEWS.

In the course of a conversation with Managing Director W. J. Harris and Superintendent N. Tregear yesterday the latter said: "The way the mine is equipped at present we cannot materially reduce the cost of mining below the figures for October. I am confident, however, that with a vertical shaft, such as the company proposes to put down in the near future, with all the modern appliances for handling ore with ore bodies of the present size we can mine to the 2,000 ft. level fully as cheaply as we can now at the 700 ft."

In order to make plain the significance of Mr. Tregear's statement it may be as well to state that in the month of October ore was mined from the 200 east and west stopes, the 450 south stope, the 500 east stope, the 600 west drift and stopes and the 700 west drift and stopes, and at the same time cross-cutting to the south was done on the 500 and 600 ft. levels and the main shaft was sunk to and a station cut at the 800 ft. level, so that the development of the mine was kept well in advance. As a matter of fact the management is now assured of being able to maintain regular shipments of 450 tons a day, as at present, for the next four years.

DEVELOPMENTS OF THE MONTH.

In my last letter I told you of the finding of 8 ft. of high grade ore to the south of the 600 west stope, about 40 ft. below the 500 level. Since then a crosscut has been run south from the 600 level opening up the same body of ore, and another crosscut on the 500 level has proved the ore body over 10 ft. wide at that point, every bit of it being solid, high-grade ore. These discoveries have opened new stopping ground from the 600 level up to the 450.

The main shaft has meanwhile been continued down to the 800 ft. level, a station cut out and a crosscut started to the north which has entered the vein. Two machine drills are working abreast, and it is expected the hanging wall will be reached in about 40 ft.

THAT MINORITY INTEREST.

I looked several times during the past month and especially towards the end of last week as if the British America Corporation and the minority shareholders in the Le Roi Company were about to close a deal. Ex-Governor Mackintosh and Edwin Durant, office manager of the B. A. C., spent several days in Spokane, and negotiations between the two parties resulted without, however, any sale or agreement of sale being effected. It is well understood that the 200,000 odd shares controlled by Senator Turner cannot be bought for much less than \$1,700,000, and this sum the London Company is either unable or unwilling to pay. It is gratifying to note, however, that the relations between the two factions appear to be firmly established once more on a friendly basis, but it is also apparent that if the developments in the mine on the 800 ft. level prove to be anything like those on the 700, another big advance in the price of the shares held by the minority shareholders may be expected.

ORE SHIPMENTS.

The shipments of ore from Rossland's mines keep on increasing steadily, and for last week (ending Nov. 12) the total was 4,635 tons. For the corresponding week last year the shipments, which were fully up to the average, were 1,350 tons. Since January 1, the total is 108,048 tons as compared with 72,840 for the whole of 1897. The shipments this year would have been much greater but for the fact that the Le Roi was closed down for months on account of the negotiations with the British America Corporation.

A FIFTH BANK.

In my last letter I told you the Bank of Toronto had leased quarters and would open a branch here in a few days. They expected to have been ready for business long ago, but have been delayed. They will, however, get opened this week. Since then the Bank of British Columbia has secured quarters and they will be in business within a few days. This will give Rossland branches of five of Canada's great chartered banks.

THE RAILROAD SITUATION.

For nearly a year the business men of Rossland have been urging on the C. P. R. the advisability of building a cut off to the Crow's Nest Pass line from the south end of Kootenay Lake, via Ymir, Sayward, Trail and Rossland, to some point on the Columbia and Western extension near the summit of the range between Arrow and Christina lakes. This route was indeed urged on them as preferable in every way to the line adopted via Nelson and Robson, but was turned down by Vice-President Shaughnessy after very scant consideration.

The advantages of this route from the C. P. R. point of view were considered here to be many and obvious. First, it affected a saving in distance of about 150 miles; second, it ran all the way through territory already producing considerable traffic and destined undoubtedly to produce the great bulk of the tonnage in Southern British Columbia; third, in traversing the Salmon River valley it paralleled the Nelson and Fort Sheppard Railway, now owned by the Great Northern, in the only section in which it enjoyed a monopoly of business. Fourth, it crossed the Columbia River at the only natural bridge site between Revelstoke and the International bound-

ary line; fifth, it passed through the smelter town of Trail and the City of Rossland, thus giving the main line two important towns instead of a wilderness to traverse; and, sixth, it obviated the necessity of two railways from the Columbian river to the summit of the range west of the river.

The only advantage which the other route could be said to possess lay in the fact that from the south end of Kootenay Lake to Nelson the line would be built on the lake level. On the other hand that section (not yet begun) is very expensive to build, and will not add a pound to the company's traffic. Again, the line between Rossland and the summit of the divide to the west is enormously expensive while the construction of a new line on the same grade between Sayward or Trail and Rossland, and thence via Sheep Lake to Gladstone on the present Columbia and Western extension, would not have cost a half of the money.

JIM HILL TAKES A HAND.

However, as stated already, the C. P. R. turned the project down. In some way or another it came to the attention of J. J. Hill, of the Great Northern, and he seems to have realized its advantages and determined to prevent the C. P. R. from ever repeating its blunder in failing to adopt it. His engineers are now surveying the line from Kootenay Lake to Trail, and one section of it, namely, that from Sayward to Trail, is to be built next spring. He has also announced his intention of building into the Boundary country next year, and will apply for a charter for the Keith River Valley Railway next session.

THE BOUNDARY COUNTRY.

In the meantime the Boundary country is making great progress. For several years it has been a question which of the many towns in that section was to be the most important centre, but at last the palm seems to have been awarded to Greenwood. Three banks (Montreal, British North America, and Bank of Commerce) have opened branches there in the past few weeks. The C. P. R. appears to have decided to radiate its branch lines from that centre to the various camps in the district and is pushing the construction of its main line (the Columbia and Western extension above alluded to) for all it is worth. The mines around Greenwood are also being rapidly developed and in several of them, notably the Old Ironsides and Knob Hill, the ore bodies opened up are simply enormous.

THE REPUBLIC CAMP.

Another camp which is developing at an astonishing rate is the Republic camp on the Colville Indian reservation in the State of Washington. Two strikes of the first magnitude have been made there lately, the most important being in the Republic mine itself. This property and its first extension, the Jim Blaine, are controlled by Patsy Clark and his associates, but about a fourth of the stock in both companies is held in Rossland. As I told you in my last a half interest in the Republic was under option to the Exploration Company at the price of \$2,500,000 for the mine. The option was allowed to expire and a few days later the No. 3 tunnel cut the vein at a depth of 420 ft. The showing there consisted of 16 ft. of free-milling ore averaging \$260 to the ton. This body is now being drifted on in the direction of the Blaine, which will catch the Republic ore chute on the dip if the dip does not change) at a depth of about 800 ft.

The other big strike was on the San Poil, where the drift from crosscut tunnel on the 250 level opened up 5 ft. of \$50 ore.

Work is going on in many other properties in the near vicinity of these mines and individual properties in outlying camps in the same district are also beginning to attract attention, especially in Rossland, where many of these claims are partly or wholly owned.

NORTH FORK OF SALMON.

Another most interesting section tributary to Rossland about which little is heard is the valley of the North Fork of Salmon River. This district has its outlet at the town of Eric, on the Nelson and Fort Shepherd Railway, about 11 miles from Ymir and 16 miles from Sayward on the Columbia River. About three hundred prospectors have been at work in the valley for the past two years, and as a result some nine hundred mineral claims have been located. A waggon road has been built up the valley from Eric to the Second Relief mine, a distance of 13 miles, at a cost of \$15,000.

With the completion of the waggon road two mines began to ship. The nearest to Eric is the Arlington, owned by a syndicate of Victoria people headed by ex-Lieutenant-Governor Dewdney. The mine is opened by a 150-ft. incline shaft, showing 5 ft. of ore in the bottom. The ore is free-milling quartz and averages \$70 to the ton in gold. The mine will not be equipped with a mill until next season, and in the meantime such ore as is taken out will be shipped to the Northport smelter.

THE SECOND RELIEF.

The Second Relief, owned by the Finch syndicate of Spokane, is the most extensively developed property in the camp, having 1,200 ft. of tunnelling on the ledge, 250 ft. of shafts, and 150 ft. of crosscuts. The ore body, which is a copper sulphide in a quartz gangue, shows an average width of 34 inches throughout the workings and an average value of over \$50 to the ton in gold. About 2,000 tons of ore are on the dumps ready for shipment. Thirty-five men are employed, and this force will be increased to eighty men this winter. The greatest depth attained on the property at present is 400 ft.

THE BIG BUMP.

Adjoining the Second Relief is the Big Bump, owned largely by the same syndicate and under the same management. About 500 ft. of work have been done on it, showing similar values and an equal quantity of ore. Some shipments will undoubtedly be made from this property this winter.

THE DRUMMER.

Situated right at the head of the North Fork, about 18 miles from Eric, is the Drummer, owned by Robert Rennie and T. R. Jones. It is opened for about 200 ft. by a tunnel showing a 4 ft. body of copper sulphide ore which averages 15 per cent. copper and from \$30 to \$40 in gold. The waggon road will have to be extended six miles to reach this property, so it will be some time before it will be among the shippers.

THE NORTH FORK CLAIM.

Six miles from Eric is the North Fork claim, owned by Benn Brothers and Marc Gilliam. Though only recently discovered it seems to be a most promising prospect. A 22 ft. shaft shows 2 ft. of copper sulphide ore all the way down averaging over \$23 in gold and copper.

THE WAR EAGLE.

The management of the War Eagle Company expects to have the new hoist and compressor working by the middle or end of December. Meanwhile work has prac-

tically been suspended in the lower levels, and the fourteen drills now in use are at work in the 375 ft. level and the upper workings. During the month the company sold 100,000 shares of its treasury reserve at \$2.70, and has wiped out all the debt accumulated while the mine was being developed.

THE CENTRE STAR.

Excellent progress is being made with the new three compartment shaft, and a side-track is being built to it from the main line of the Columbia and Western. Underground a great deal of work is being done, eighty-five miners being employed altogether. The present compressor is being utilized to its full extent and in addition a good deal of work is being done by hand. The north ledge is being opened up by drifts from the crosscut on the main tunnel level, and the winze at the west end of the mine is down 50 ft. below the Le Roi 500 level, which connects with the Centre Star workings.

THE JUMBO.

The No. 2 tunnel in the Jumbo has been continued across the ledge, but has not yet reached the hanging wall. In the new No. 3 tunnel about 50 ft. of ground has been gained during the month, and it is still in country rock, though the ledge may be broken into at any time. On the whole, the developments on the No. 2 level have not come up to expectations.

B. A. C. PROPERTIES—COLUMBIA AND KOOTENAY.

Tunnels Nos. 3, 4 and 5 have each been advanced along the ledge about 135 ft. during the month, and the new tunnel No. 6, in 30 ft., is now being driven with a machine drill, having been started by hand. Tunnel No. 5 is now known to be on the main vein, and is expected to soon strike the big chute found in No. 4.

GREAT WESTERN AND NICKEL PLATE.

There is no change to report in either of these properties during the past month. Development work is being carried on with a force of 45 men. In the Nickel Plate 453 ft. of drifting were run with three machines in thirty-one days—in all probability a working record for the camp.

THE JOSIE.

The exploration work on the 300 ft. level in the Josie has been continued steadily with very satisfactory results. In the west drift crosscuts are being run north and south.

THE NO. 1.

The tunnel on the No. 1 is now in 330 ft., and still on the vein. The 200 ft. station has been cut in the vertical shaft and drifts have been started both ways. It may be necessary to crosscut to pick up the vein.

GENERAL NOTES.

During the month of October 1,570 ft. were driven with thirteen machines, and during the first six months of work the B. A. C. has done 6,500 ft. of development in all its properties in this camp. One hundred and fifty men are now employed. The new offices are complete and the storehouse, 30 x 60 ft., nearly so, while a machine shop, 40 x 80 ft., is well under way.

THE MONTE CRISTO.

No one here seems to know whether the expert examination of the Monte Cristo which was promised by the Montreal management when the mine was closed down, has been made by Judges Hastings and Hardman or not. Those best posted about mining matters here, however, have no hesitation in asserting that the property is in very bad shape, and that practically no ore has been found in the lower workings. It is said that when Mr. Crocker, of San Francisco, was here some months ago with his expert Covington Johnson, he turned the property down and ceased his contributions towards its development.

IRON MASK.

The principal development work at present on the Iron Mask is being done in the west ore body in the disputed ground. Here the winze from the tunnel is now down 25 ft. showing 4 ft. of \$50 ore. The foundation for the new compressor plant is all ready for the machinery which is on the way from the factory at Sherbrooke, Que. Louis Janin, of San Francisco, has been retained as an expert witness in the lawsuit with the Centre Star.

THE GIANT.

The crosscut tunnel has cut the upper vein, but without developing any particular ore body, though considerable fine-grained iron is scattered through the quartz. The vertical shaft to develop the lower vein is down over 100 ft. and will be continued without cross-cutting in the expectation that it will cut the ledge shortly on the dip. It now shows 2 ft. of ore on the bottom.

THE VIRGINIA.

The vertical shaft on the Virginia, now being sunk to the 500 ft. level, is down 370 ft. No other work is being done in the mine.

THE GERTRUDE.

The shaft is down about 120 feet on the footwall side of the ledge and at a depth of 200 feet crosscuts will be run to intersect it. The vein is the same which is at present being developed in the No. 1 by a shaft and tunnel. The tunnel is rapidly approaching the shaft which it will tap at a depth of 86 feet.

THE COXEY.

On the Coxey the lower tunnel is being continued to strike the copper vein which is expected to be met with shortly. Recent development work in the upper tunnel has exposed a body of good ore which is now being drifted on. On the south vein a little surface work has been done in order to trace the vein and fairly good assays have been obtained. On the whole the outlook for the Coxey is most encouraging.

THE MASCOT.

No startling developments are reported from the Mascot. The No. 1 tunnel is in over 400 feet, giving a depth of 160 feet, showing a little ore. The winze is down about 50 feet, showing four feet of mixed ore. The new tunnel, which will open the ledge to a depth of 800 feet, is 35 feet under ground. The new compressor has arrived, but has not yet been installed.

THE IRON HORSE.

Development work on the Iron Horse has been suspended, pending the arrival and installation of the new compressor plant, for which the foundations and buildings are about ready.

THE NOVELTY.

Work has been suspended on the lower vein of the Novelty and is being concentrated on an extension of the upper Giant vein. Here two large surface cuts have been made, exposing a big quartz ledge, from which assays up to \$24 have been obtained. A shaft now down 12 feet has been started in one of these cuts.

THE COMMANDER.

Work on the Commander shaft is being continued, and the 300 foot level is expected to be reached about the first of the month.

LILY MAY.

The Lily May, which is under bond to an English company, started work since I last wrote. The only work being done is on the No. 1 shaft, which is going down in ore. It is now 115 feet from the surface.

CANADIAN GOLD FIELDS.

The crosscut tunnel on the 350 foot level is being continued by contract.

THE HOMESTAKE.

This company was recently reorganized on an assessable basis and is now well supplied with working capital. It started work again on Sunday after being shut down for about a year. It is developed by two shafts, a short tunnel and several surface cuts. Work is being confined to the No. 2 shaft which is down 125 feet and shows considerable ore of fair grade all the way down and in the bottom. This shaft will be put right down to the 300 foot level.

GRAND PRIZE.

The shaft on one of the new showings near the west end of the Grand Prize is now down about 25 feet, showing some ore. The other workings are temporarily abandoned. A bunk house and shaft house have just been completed.

ABE LINCOLN.

The shaft on the Abe Lincoln is down nearly 200 feet and has recently cut another stringer of good quartz and copper ore.

THE WHITE BEAR.

Until lately all drifting in the workings of the White Bear has been to the west but a drift to the east (towards the Le Roi) is being run on the 250 foot level. No ore body has yet been encountered but the showing is encouraging and a pay chute may be cut at any moment.

THE GOOD HOPE.

This property closed down during the month for lack of funds. I understand the company still has considerable treasury stock left but at the price it commands I do not see how it is expected to develop a mine.

GOOD FRIDAY.

Another deal on this property is said to be pending. It has been idle for a month or two.

DEER PARK.

The shaft on the Deer Park is now down below the 300 level and a station has been cut preliminary to drifting. Some exploratory work is being done in two headings on the 100 foot level in ore to determine more accurately the course and extent of the ore bodies. In one heading the ore clean across the face averages \$12 in all values.

EVENING STAR.

For the past two months six men have been working on eight hour shifts in the lower tunnel of the Evening Star and by this method two feet of ground have been broken a day at a cost to the company of \$14 a foot. The workings are all in ore at the face, assays ranging from \$4 to \$16 to the ton.

ATLANTIC CABLE.

Work on the Atlantic Cable has been suspended for the winter and it is to be equipped with machinery in the spring.

SOPHY MOUNTAIN—THE VICTORY-TRIUMPH.

The management of the Victory-Triumph has every reason to feel gratified at the results of last month's work. A vertical shaft was sunk 104 feet with a view of developing the Triumph east vein, which showed a good grade of gold-copper ore on the surface. The crosscut from the bottom of the shaft proved the vein to be eight feet wide and a well defined fissure. Samples taken the full width of the ledge run up to \$24 in all values. Drifts are now being run both ways on this level to open up the vein and a contract has been let for a shaft house and hoisting plant.

THE VELVET.

The lowest level in the Velvet shows good ore in the north drift and has just lately struck the vein in the south drift showing a foot of good ore. The mine now has more high grade ore on the dump than at any time in its history but development will be continued in all probability without any shipments being made this winter.

THE SANTA ROSA.

The tunnel on the Santa Rosa, which is across Sheep Creek from the Victory-Triumph, is in 400 feet and the property has been closed down for the winter. The developments have been so satisfactory that it has been decided to equip the mine with machinery in the spring.

YMIR DISTRICT.

There is not much news from the Ymir district. Dundee and Tamarac are busy installing machinery and the Porto Rico is still waiting delivery of a good part of the machinery for its new 10-stamp mill. Mr. Corbould, managing director of the Canadian Pacific Exploration, Limited, which owns the latter property, spent two weeks at the mine and is now in California. He intends being back here before the mill gets started.

THE GOLDEN GATE.

A new property which is attracting a good deal of attention is the Mountain Chief on Dog Creek, near the line of Columbia and Western extension to Boundary district, which belongs to the Golden Gate Development Company. Only surface work has yet been done, but a good deal of high grade copper ore has been uncovered. A trial shipment of ten tons is to be made this week to the Nelson smelter.

THE STOCK MARKET.

The feature of the month was the boom in Cariboo (Camp McKinney), which advanced from 66c. to \$1.15, and is now quoted at \$1.10.

In local stocks, Abe Lincoln, White Bear, Iron Mask and Gertrude were most in demand, and Old Ironsides, Knob Hill and Smuggler took the lead in outside stocks. Reservation stocks were also very active.

Monte Christo was an extraordinarily good seller, though at a constantly falling price, until bottom has apparently been reached at 9 cents.

Virginia, which closed last month at 55 dropped to 35 and is now firm at 42 cents. Almost all purchases of this stock were made locally, showing the confidence of the Rossland public in this property.

Deer Park is in slightly improved demand at 18½c.

Homestake has not had time yet to show any improvement, but the defaulting stock has all been cleared off the market.

Giant and Novelty have been stationary, as has Commander, Iron Colt and Grand Prize.

Iron Horse has been quiet, but has maintained its price.

White Bear has only held its own, though very largely traded in.

Gopher is in fair demand, but R. E. Lee is a slow seller.

There have been no transactions reported in Canadian Gold Fields, Alberta, St. Paul or Good Hope.

Iron Mask, which closed last month at 75, dropped to 59, and has again recovered to 74. It is evidently going to continue on the upward grade.

War Eagle is now hard to get at \$3, but dropped as low as \$2.92 during the month.

Evening Star was in considerable demand up to 6 cents.

Jumbo has been stationary around 42 cents.

Knob Hill and Old Ironsides are now quoted at about 65 cents each. They seem to be the favorite Boundary stocks.

Smuggler appears to be hard to get at 20. It is about the only Fairview stock dealt in here.

Ymir stocks are reported in fair demand.

Republic stocks advanced all along the line. Jim Blaine is quoted at 70 to 75 cents, a rise for the month of 40 cents.

San Poil has improved a cent or two, and is quoted 76 to 78 cents.

No Republic is obtainable under \$4, and is mostly held at \$4.50 or better. This is almost double the price of last month.

H. W. C. JACKSON.

ROSSLAND, Nov. 19.

MAY BUILD VIA YMIR.

News comes from Ymir that the C.P.R. has had a corps of engineers at work between that point and the south end of Kootenay Lake surveying the proposed cut-off to the Crow's Nest Pass line and that they report having discovered a feasible route. It is therefore just possible that Jim Hill may be headed off yet.

A NEW STRIKE.

An interesting strike and one which may prove to be of real importance has been made on the Spitzee Fraction which is located in the middle of the town site. At this point the old narrow gauge railway has a rock cutting about 150 feet long and 20 feet deep. This cut exposed a ledge of an average width of two feet which assayed moderately. About 50 feet west of the cutting the C.P.R. has just completed a longer, wider and deeper cut (one of the changes of line rendered necessary by the alteration from narrow to standard gauge) and here the same ledge has been exposed showing two and a half feet of clean ore. Assays range all the way from \$4 to \$22 and an average sample taken Friday went \$11 in gold and four per cent. in copper. More will undoubtedly be heard of this claim in the future as the ledge has all the indications of being a true fissure vein.

THE COXEY STRIKE.

The ore body found on the upper tunnel of the Coxe, which belongs to the Montreal Goldfields Company, managed by C. J. McCuaig, of Montreal, and whose resident engineer is R. G. Edwards Leckie, is developing wonderfully. Ever since it was found the drift has shown eight feet of solid ore, every pound of which, it is confidently believed, will pay to ship. The average is said to be a trifle over \$16 to the ton.

BANK FOR GRAND FORKS.

The Bank of Montreal, which has always shown itself as concerns Kootenay the most enterprising in Canada, yesterday opened a branch at Grand Forks. This is the first chartered bank in that town. It may be of interest in this connection to state that the Bank of Montreal has owned lots in both Greenwood and Grand Forks for more than a year.

OLD IRONSIDES AND KNOB HILL.

The latest news from Greenwood is that the crosscut of the mammoth ledge on the Knob Hill has at last been completed. It shows the ore body to be 137 ft. wide and the average value of this ore is claimed by the management to be \$20 per ton. Everyone is not, however, agreed as to the value, and the opinion of those best posted on the property, but who are not financially interested in it, is that the value will average about \$12. As the ore all runs well in copper, and is in fact specially adapted to economic matteing, there can be no doubt that the mine is a bonanza such as only Butte and Rossland can show. The Old Ironsides is the adjoining property on the same ledge and is principally owned in Spokane. The Knob Hill is owned by a Canadian company of which Mr. Miner, of the Granby Rubber Company, is president.

THE LE ROI DEAL CLOSED.

ROSSLAND, November 20.

The city is in a flutter of excitement over the Le Roi-B.A.C. deal. On Saturday the news was received here that negotiations between the B.A.C. and the minority interest in the Le Roi had suddenly come to a head. At present the situation is just this. The B.A.C. has offered \$7.25 cash per share for the whole of the stock outstanding, and Senator Turner and his friends have concluded to accept. The Hon. T. Mayne Daly, counsel for the B.A.C., has been in Spokane for four or five days and the papers are all ready for signature, only awaiting the arrival of ex-Governor Mackintosh to complete the deal. Mr. Mackintosh is due in Spokane to-morrow morning, and it is expected everything will be settled before noon.

This turn of affairs was quite unexpected. Mr. Mackintosh had gone to Vancouver to visit his family, and W. J. Harris, managing director of the Le Roi, had no intimation that any new negotiations were on foot till Friday evening, when he got a telegram from Spokane requiring his presence. He left that night on a special train (about the tenth special which has been chartered in connection with this deal), and Edwin Durrant, office manager of the B.A.C., followed him next morning.

BUYING ORDERS CABLED.

No sooner had the leading men in Rossland become satisfied that the sale was a "go" than they began to lay their plans to profit by it. All day long brokers and others have been cabling advice to their friends in England to buy B.A.C. stock, but the climax was reached to-day when a local syndicate, formed late last night, sent a buying order for 20,000 shares through the Bank of Montreal. The feeling here is that it does not matter a particle what London thinks of it, or what Whittaker Wright's enemies and the bears generally try to do to the stock, it is bound to go up. Latest quotations received here range about 14 shillings, and as the Le Roi can pay dividends of at least 10 per cent. on the whole capital of the B.A.C., and is actually worth far more than is being paid for it, Rossland is prepared to stake all its loose money on B.A.C. shares going to par or a premium.

THE 800 FT. LEVEL.

In the meantime it may interest your readers to know that the crosscut from the bottom of the shaft on the 800 ft. level of the Le Roi had got 26 ft. into the ledge and everything is ore of shipping grade. It will average close to \$20 per ton. On the level above the ore body was 43 ft. wide where crosscut at the same point. No drifting will be done on the 800 ft. level until the hanging wall is reached. I have it on the authority of two famous engineers who have lately examined the mine that the ore body between the 600 and 700 ft. level is so large that, if all other work in the mine were suspended, it could not be exhausted in the next two years at the present rate of production, namely, 500 tons per day.

THE MONTE CHRISTO.

There is no truth in the report that the Monte Christo is about to resume work. I have it on the authority of the management that it has not even been examined.

H. C. JACKSON.

COMPANY NOTES.

Scottish Colonial Goldfields, Limited.—The annual general meeting of this company was held recently in Edinburgh—Mr. A. Johnston Douglas, the chairman, presiding. There was a good attendance. The directors' report stated that the period covered by the accounts was 20 months, the date of the incorporation of the company being 12th March, 1896. It was intended that the annual meeting should have been held on an earlier date, but this was found to be impossible, in consequence of the difficulties and delay in connection with the completion of the purchase of the Idaho and St. John, and other properties. Regarding Western Australia, it was pointed out that the severe depression in the mining market during the past eighteen months had prevented the directors from realising to any extent the interests held by the company in various undertakings in this Colony; and, for the same reason, it had been deemed advisable to delay the public issue of the shares of the Lake Way Gold Mine, Limited. The latest accounts from the manager of this mine were satisfactory, and he advised that the pumping machinery which had been erected was working well, and that everything else about the mine was in good order. The directors were hopeful, from the reports furnished to them by several independent engineers, that the mine would prove a good investment. Another property, situated in the Mount Jackson district, in which the company, along with others, was interested, was abandoned after considerable development, as the results did not justify further expenditure. The other interests of the company in Western Australia consisted of holdings in a number of prospecting, mining, and trading companies, both of a speculative and investment nature, which would be disposed of from time to time as occasion offered. Meantime it was expected that they would yield a satisfactory return, keeping in view the terms upon which most of them were acquired. As to British Columbia, the shareholders were reminded that as stated in a circular, dated July 3 last, the directors had entered into a contract for the purchase of a large group of mining claims in this province. After protracted negotiations, the purchase was finally completed in the month of September, and the directors had pleasure in intimating that the properties were now being profitably worked. Two companies had been formed for treating the mineral derived from the mines. At present the output was exclusively from the Idaho and St. John claims, but development work on several of the others was being vigorously carried on. Regarding the other options in British Columbia, development work was being carried out on the "Sir Walter" and "W. Y. O. D." claims, of which the company owned one-third, with the right to acquire a further interest. The remaining options had either been allowed to lapse,

quest for the precious metal which some of us are ready to almost sell our souls for, your directors thought it advisable to deal a little in the occult art—to wit, the divining rod. The services of a distinguished professor were obtained, and on traversing your ground he had not gone far when the mystic rod began to wobble and be attracted in a marked degree to Mother Earth. This continued for a little while, the professor's face being a study all the time. When he spoke it was with suppressed excitement, but the words that fell from his lips were like unto an oasis in the desert to a thirsty man; his remarks were concentrated into one sentence: "Jumping Jehosaphat! There's a reef here fully 40 feet wide, and highly auriferous." Gentlemen, we congratulate you on that reef—when you get it. Looking into the future, we think it probable that at least 1,000 tons of 2 ounce stuff can be raised per month, and we again felicitate you on the immense possibilities of your property. It will be seen from the report of your manager (we may remark parenthetically that he is not so Black as you would imagine, but let that pass) that we have not got that reef, but our geologist thinks from the present indications that the bread-heads met with are the advance guard, and the main body will soon be disclosed. We shall endeavor to break into it gently, for otherwise the sudden shock might be fatal to some expectant ones. In conclusion, we beg to place on record our unbounded confidence in the company of which we are fortunate shareholders, and we verily believe our most sanguine expectations will be realized—in the sweet by and-by: that is, if your funds will only see us through.

Wire Rope Cleaner and Lubricator—Experience has shown that wire ropes, such as are used in mines, cannot be properly lubricated unless they are thoroughly cleaned. An ingenious little apparatus has been constructed for this purpose; and it has been found that by its use a wire rope, 3,000 ft. long, can be cleaned and lubricated in fifteen minutes. The apparatus which is made in halves hinged at one side, is closed over the rope either at the surface or brace, and above the lubricating vessel is a collar, also in halves, and having six wire brushes which bear upon the rope. The lubricator being charged with oil, the signal is given to the engine driver to lower, and immediately the cleaner starts to revolve and to clean the rope. The cleaned portion passes through the oil vessel and thus becomes thoroughly lubricated.

Breakages of Ropes.—Last year out of 37 flat and 262 round, altogether 299, steel-wire ropes at 107 mines in the Dortmund district of Westphalia, the comparatively small number of four broke suddenly, showing a percentage of 1.34 breakages, against 1.85 in 1896, and 4.52 per cent. during the period of 26 years from 1872 to

1897. The four breakages last year occurred to only one round and three flat steel-wire ropes. In only one case out of the four breakages was there an external cause at work: too much slack given to the rope owing to inattention by the engineman when drawing up the loaded cage off the keps; and two cases occurred while the cage was so being drawn up without, however, any unusual amount of slack being mentioned, while in the other two cases breakage occurred during the lift. Two tables, annexed to the report of the "Dortmund Oberbergamt," giving these particulars—one showing the duration and the other the total load wound by the three descriptions of ropes used, flat, ordinary round and locked coil round—show that the two former classes are in both respects far surpassed by the latter.

J. B. TYRRELL, M.A., B.Sc., F.G.S.

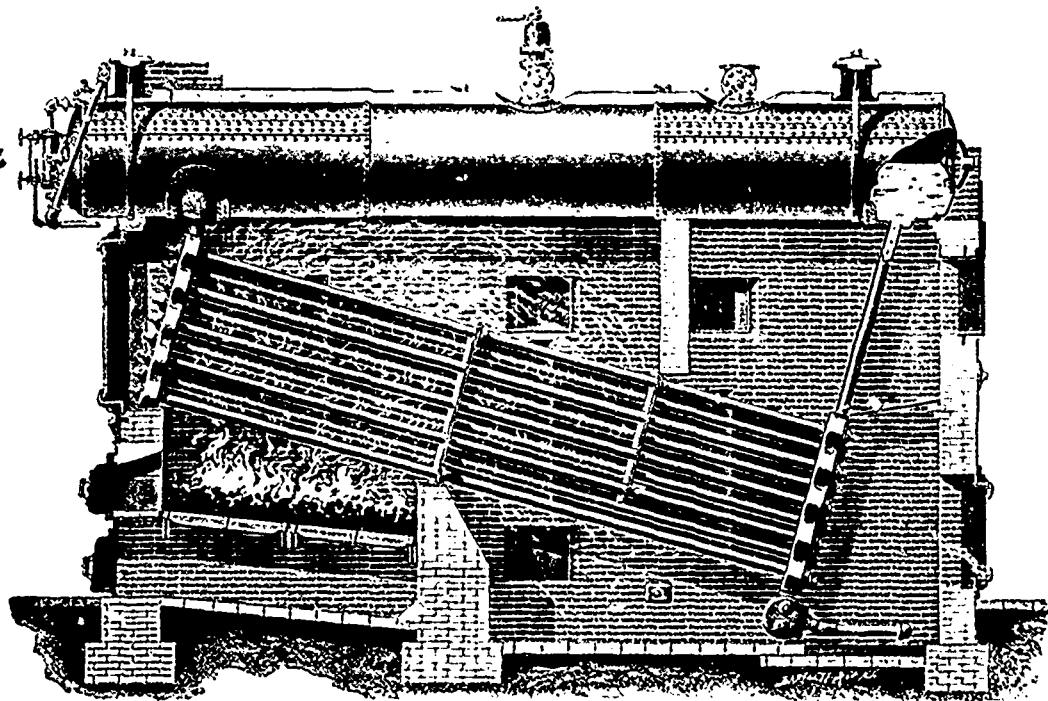
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CANADIAN MINING INSTITUTE.—A special meeting of the Council and Library Committee will be held in the library of the Institute, Windsor Hotel, on Friday, 2nd December. A large number of names will be submitted for election to membership.

THAWING DYNAMITE. All nitro-glycerine compounds freeze and become hard at about 42 degrees Fahrenheit. In this condition they will not readily explode. When large quantities of powder are to be used, a separate building for thawing powder should be fitted with a small steam radiator. Use only exhaust steam for heating the same, if possible, keeping the temperature of the room at about 80 degrees Fahrenheit. In the part of the room at the greatest distance from the radiator, place the powder on racks to thaw. When but small quantities are required to be thawed, a thawing kettle may be used, being two water-tight kettles, one smaller than the other (one placed inside the other) the cartridges to be placed in the smaller kettle, and space between the two kettles filled with hot water of from 120 to 130 degrees Fahrenheit, the kettle being fitted with a cover to retain the heat. Under no circumstances, however, should the kettle be placed over the fire to heat. When more hot water is required empty out the cold water and fill again with hot water. Under no circumstances should an attempt be made to thaw the powder by placing it in hot water or exposing it to the direct action of steam.—New York State Mining Law.

Hall Mines, Limited.—The following smelter returns for the four weeks ended 28th October are officially reported: 12 days, 12 hours smelting, 2,215 tons created, yielding 48 tons copper and 33,400 ozs. silver.

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SEE WHAT ONE MAN SAYS!
TACOMA, Wash., Aug. 9, 1908.—Mr. F. L. Ackley. I received the box of Taxider some time ago. It works fine. I have just finished mounting a beautiful swan. I have already a nice collection of birds, and a class of seven boys. It is really wonderful how it works. The very first bird I mounted was a success. Please find enclosed money order for one dozen boxes. Please rush as I am in quite a hurry. Thanking you for past favors, I remain truly yours, J. H. Flanders, Tacoma, Wash.
I have letters like this from hundreds of people and all are having success. Send for a box today. You can learn in one hour. Remember success is guaranteed from the start. Liberal discounts to agents. Taxider is manufactured by
F. L. ACKLEY, Hawarden, Iowa, U.S.A.
N.B.—For further particulars enclose stamp. References: D. O. Stone, P.M.; John Robinson, Ag't C.M. & S.P. Ry.; E. R. Ball, Ag't Amer. Express Co., Hawarden, Iowa.



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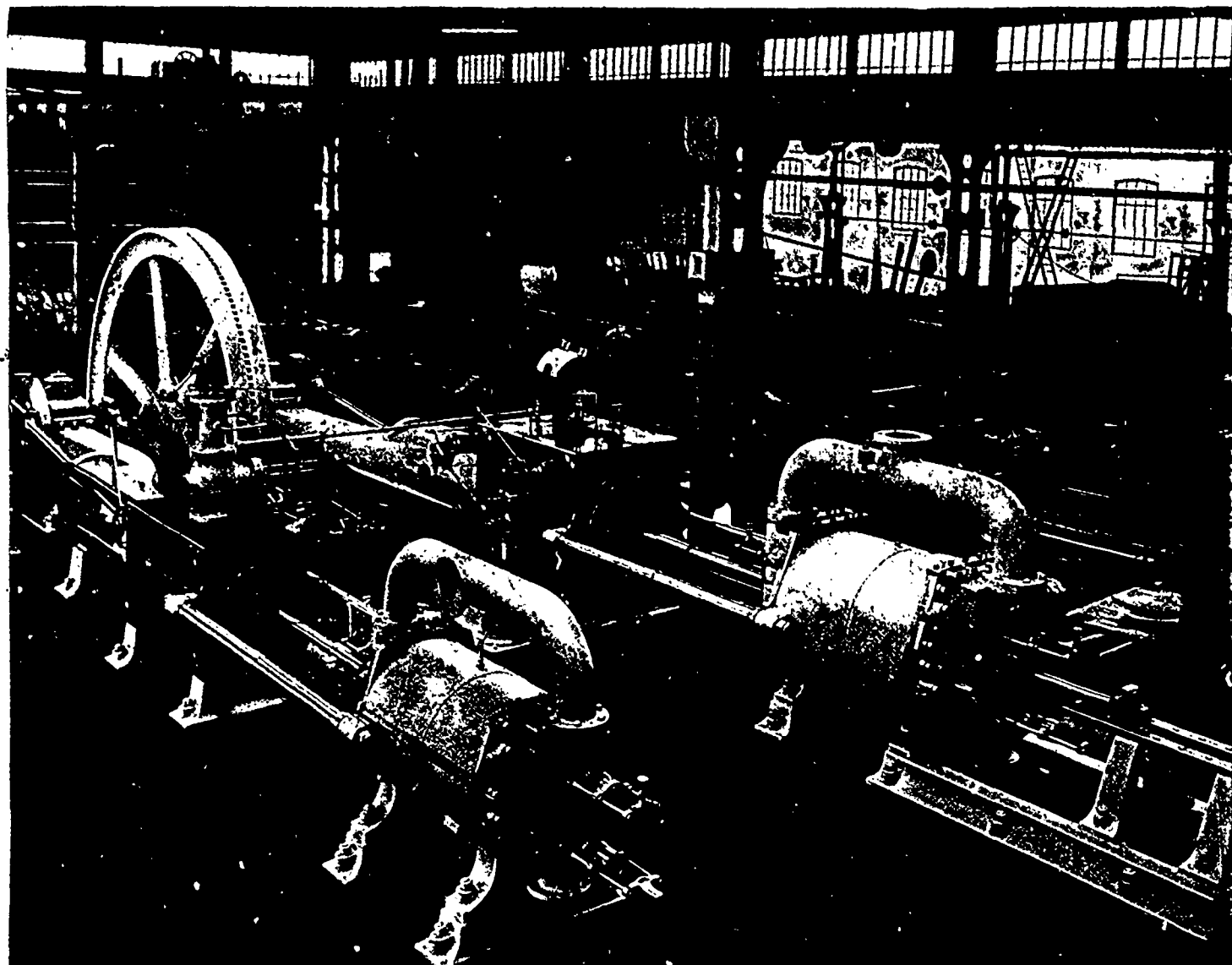
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We are, Dear Sirs, Yours faithfully, (Signed) pro S. PEARSON & SON, E. W. MOIR.

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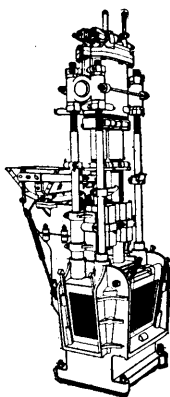
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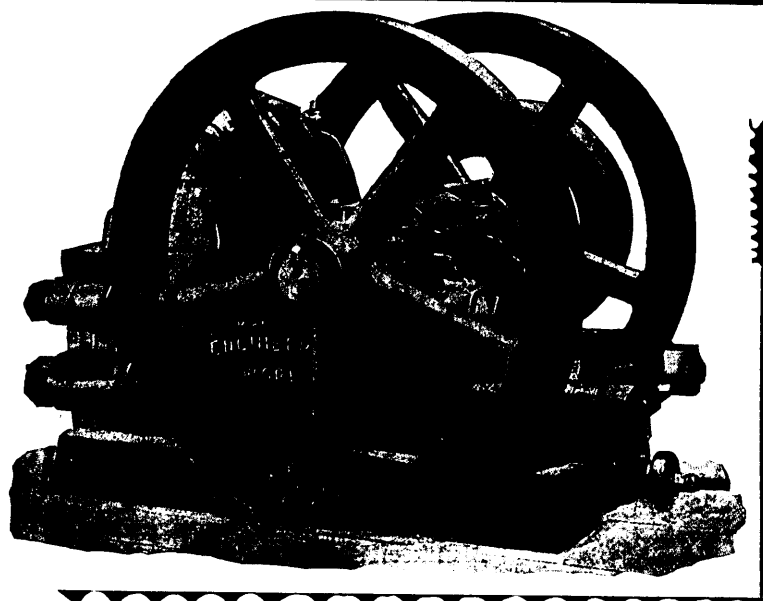
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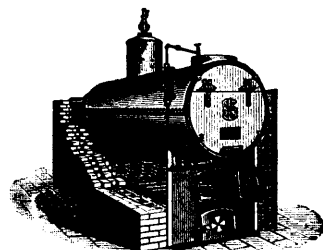
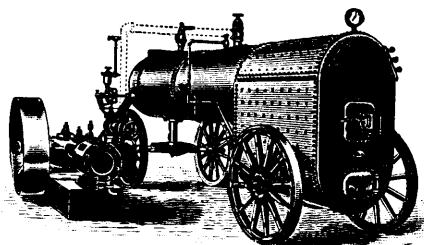
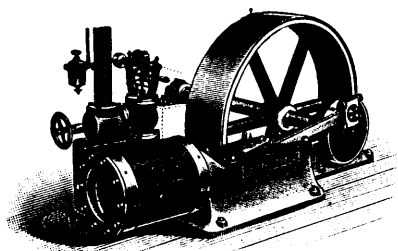
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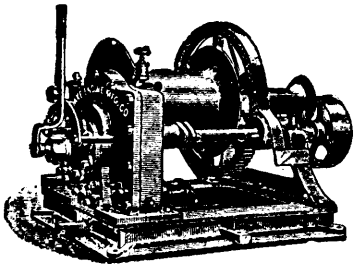
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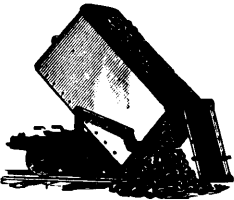
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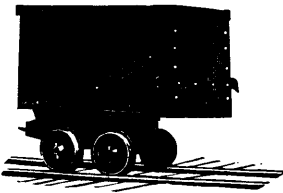


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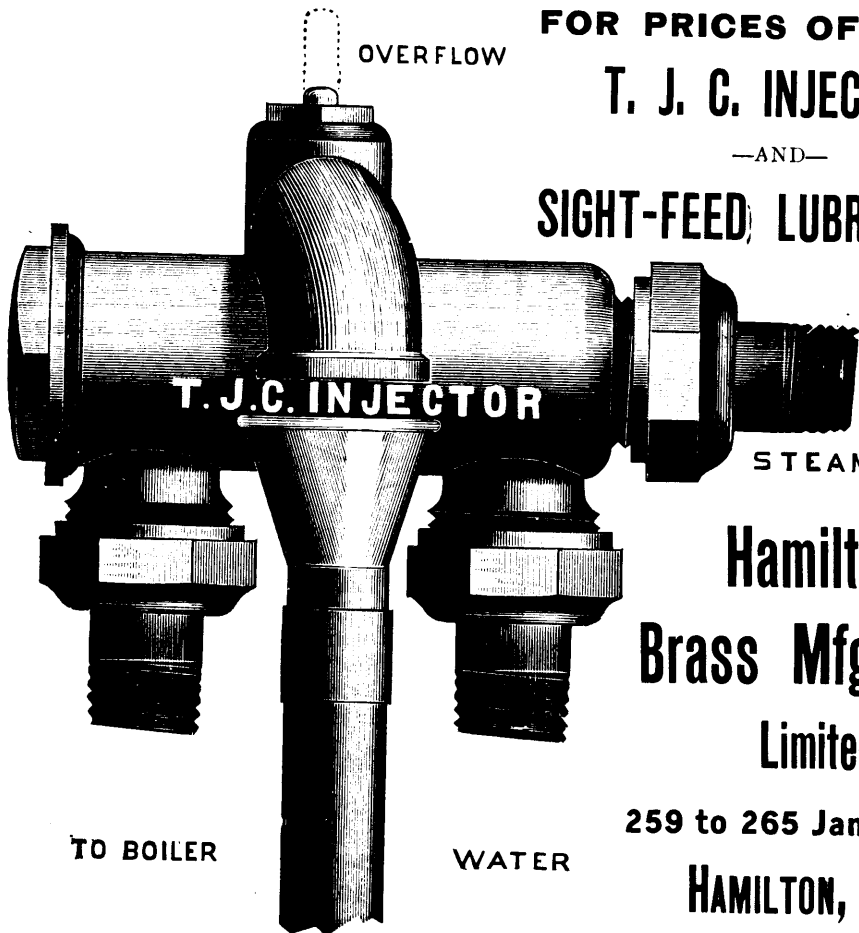
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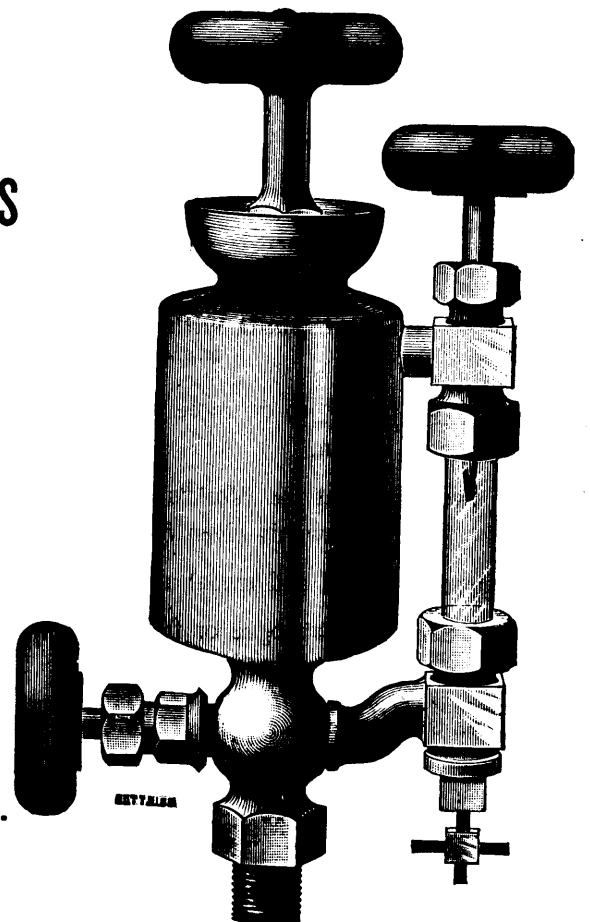
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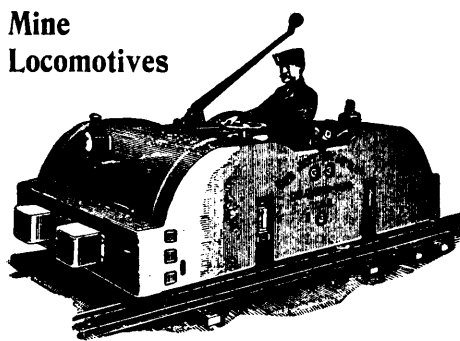
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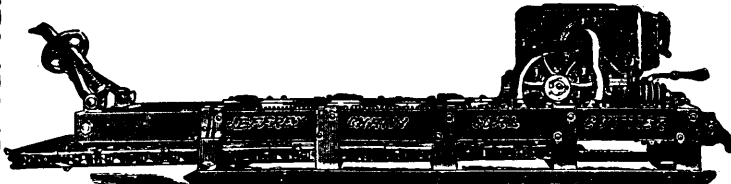
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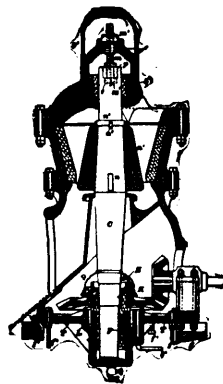
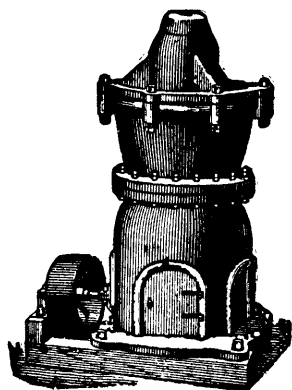
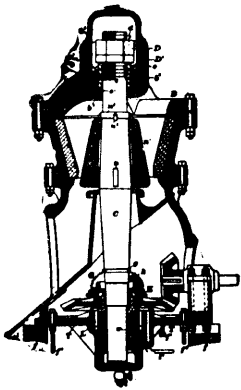
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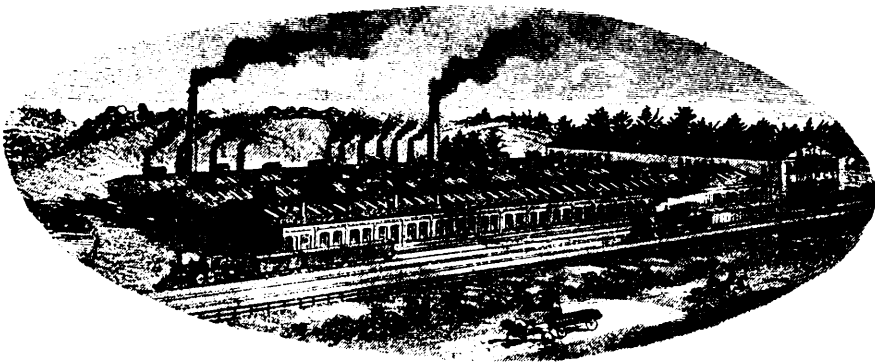
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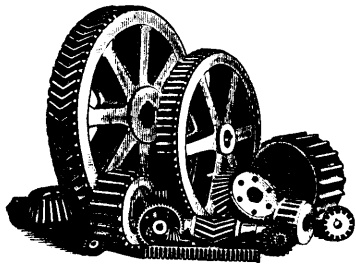
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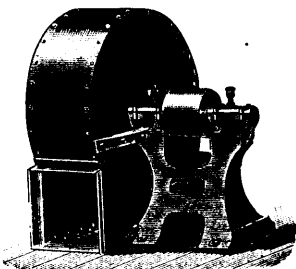
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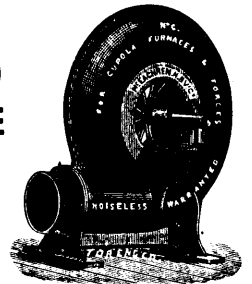
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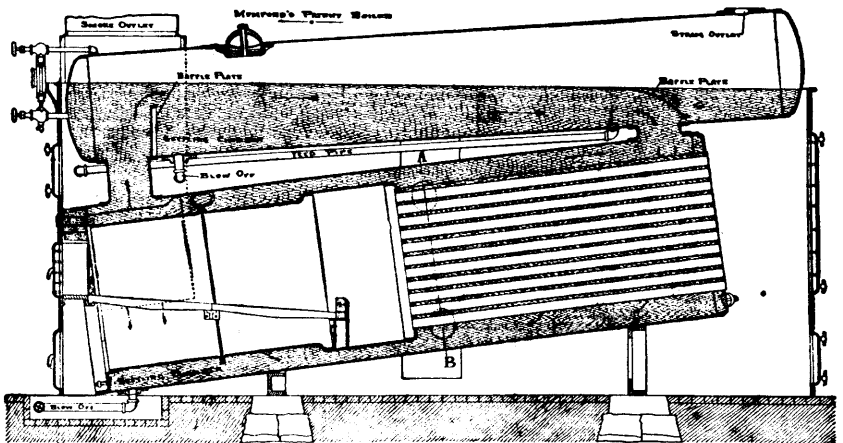
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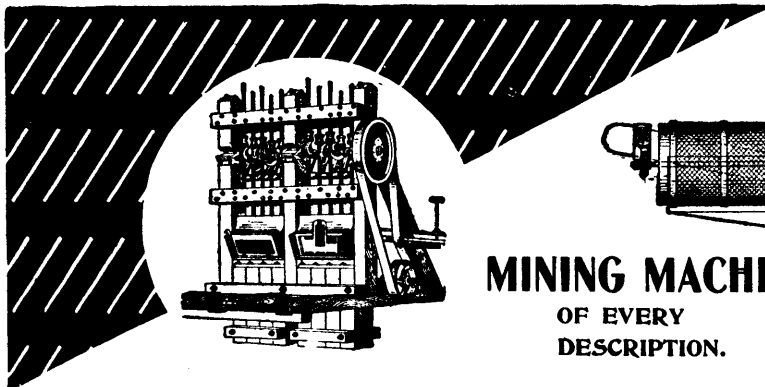
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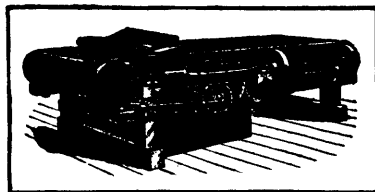
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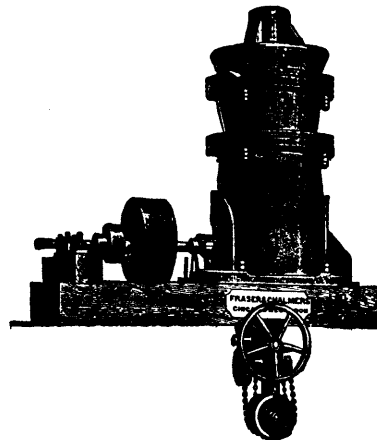
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