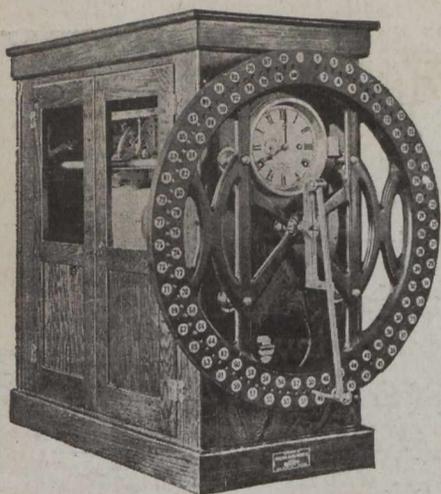


CANADIAN MINING JOURNAL

Vol. XLI.

Gardenvale, P. Q., October 1, 1920.

No. 39.



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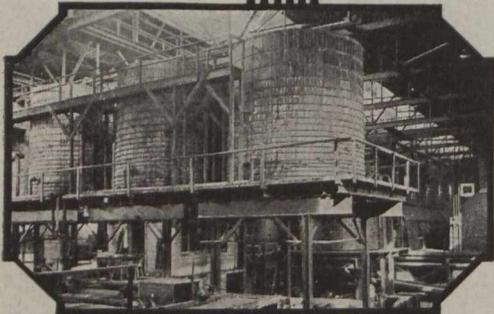
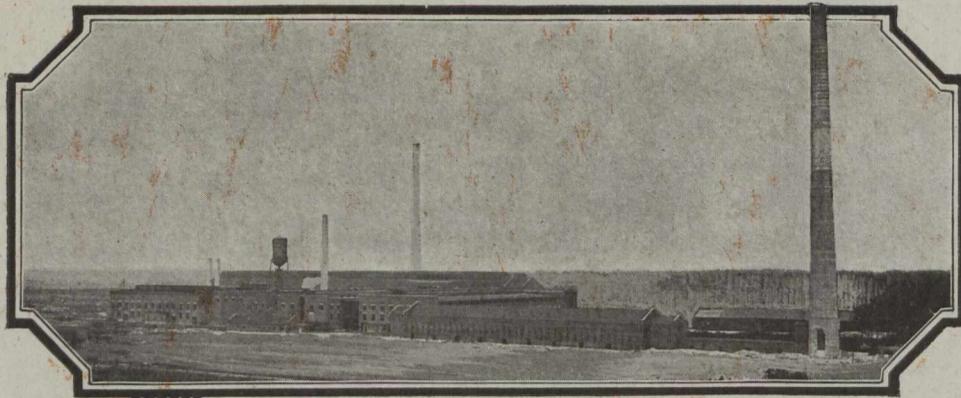
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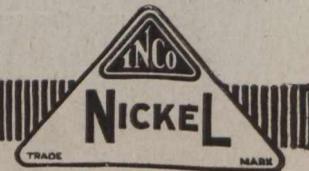
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—Frank Richards, in "Compressed Air Magazine."

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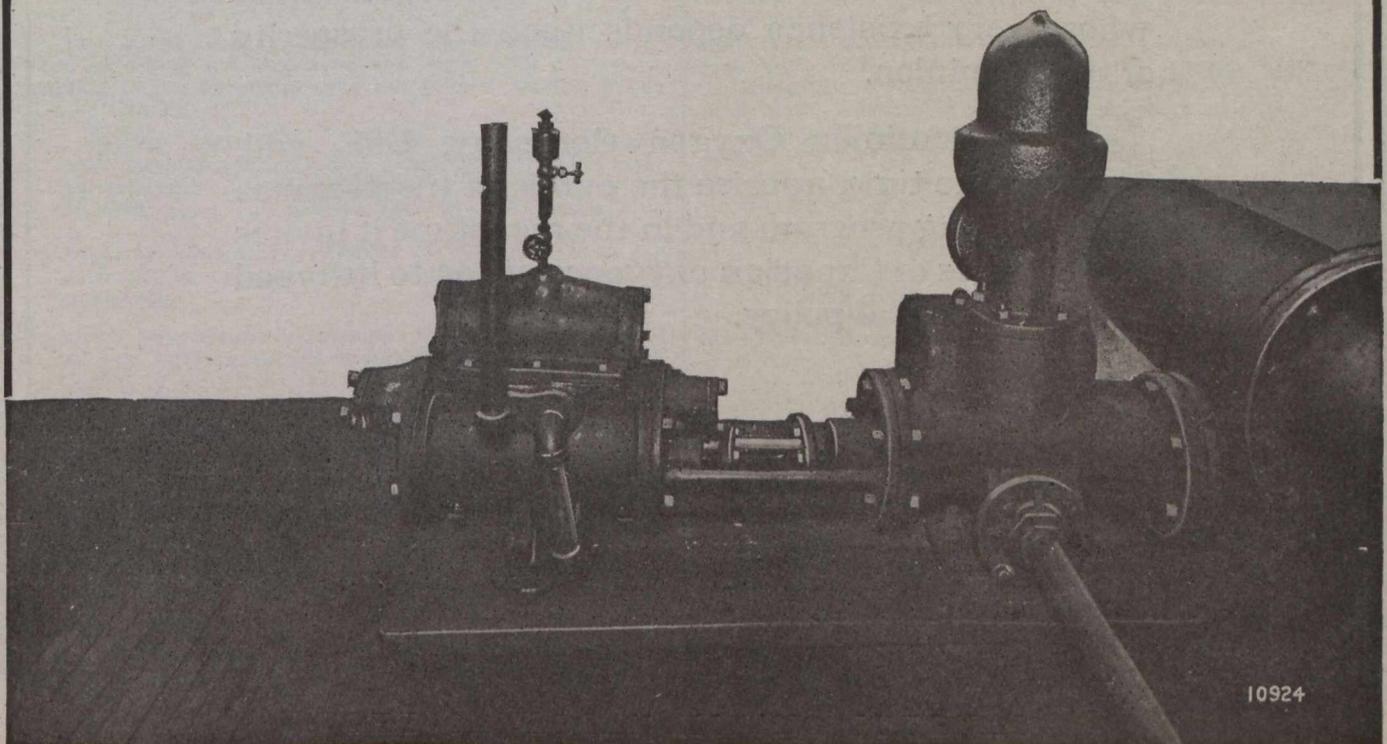
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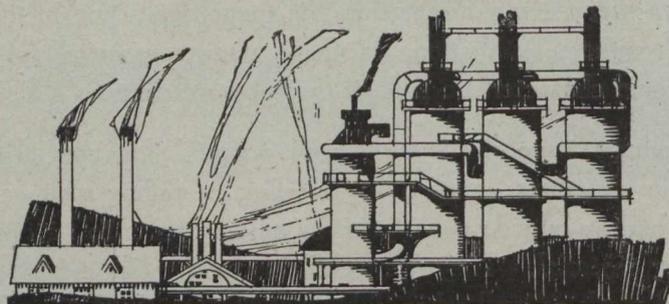
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Recent Publications

Results of forty-one Steaming Tests conducted at the Fuel Testing Station, by John Blizard and E. S. Malloch.

The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.

Building and Ornamental Stones of Canada (British Columbia). Vol. V., by W. A. Parks, Ph.D.

Peat, Lignite and Coal; their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Mineral Production Reports, by J. McLeish, B.A.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

The Value of Peat Fuel for the Generation of Steam, by J. Blizard, B.Sc.

Analyses of Canadian Fuels. Parts I to V, by E. Stansfield, M.Sc., and J. H. H. Nicolls, M.Sc.

Graphite, by H. S. Spence.

Summary Report of the Mines Branch, 1918.

The Helium Sources of the British Empire, by D. J. McLennan and others.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the development of the general mining industries of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory.—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

GEOLOGICAL SURVEY

Recent Publications

Summary Report. The annual Summary Report of the Geological Survey is now printed in parts. Applicants should therefore, state what particular geologist's report is required, or what subjects they are interested in.

Memoir 105. Amisk-Athapapuskow Lake district, by E. L. Bruce.

Memoir 108. The Mackenzie River basin, by Charles Camsell and Wyatt Malcolm.

Memoir 110. Preliminary report on the economic geology of Hazelton district, British Columbia, by J. J. O'Neill.

Memoir 111. The Silurian geology and faunas of Ontario peninsula and Manitoulin and adjacent islands, by M. Y. Williams.

Memoir 113. Geology and mineral deposits on a part of Amherst township, Quebec, by M. E. Wilson.

Memoir 114. Road material surveys in the city and district of Montreal, Quebec, by Henri Gauthier.

Memoir 115. Geology of Matachewan district, Northern Ontario, by H. C. Cooke.

Memoir 116. Investigations in the gas and oil fields of Alberta, Saskatchewan and Manitoba, by D. B. Dowling, S. E. Slipper and F. H. McLearn.

Memoir 117. Geology and ore deposits of Ainsworth mining camp, British Columbia, by S. J. Schofield.

Museum Bulletin 30. Gabbros of East Sooke and Rocky Point, by H. C. Cooke.

Map 164A. St. John, New Brunswick. Topography.

Map 183A. Harricanaw-Turgeon basin; Abitibi, Timiskaming and Pontiac, Que. Geology.

Map 185A. Sandon (Slocan and Ainsworth Mining Divisions). Topography.

Map 1584. Blairmore, Alberta. Geology.

Map 1691. Buckingham, Hull and Labelle counties, Quebec. Geology.

Map 1705. Thetford-Black Lake area, Quebec. Topography.

Map 1707. New Glasgow, Pictou county, N.S. Topography.

Map 1712. Foothills of Southern Alberta, St. Mary river to Higwood river. Geology.

Map 1724. Sheep River, Alberta. Geology.

Map 1726. Athapapuskow Lake region. Geology.

Map 1739. Portions of Bristol, Onslow, McNab, Fitzroy and Torbolton townships, Quebec and Ontario. Geology.

Map 1742. Ainsworth, Kootenay district, B.C. Geology.

Map 1793. Matachewan, Timiskaming district, Ontario. Geology.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

Communications should be addressed to The Director, Geological Survey, Ottawa.



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Dividends and bonuses paid to the end of 1919 amounted to \$15,545,238 for gold mining companies, and \$78,335,943 for silver mining companies, or a total of \$93,881,181.

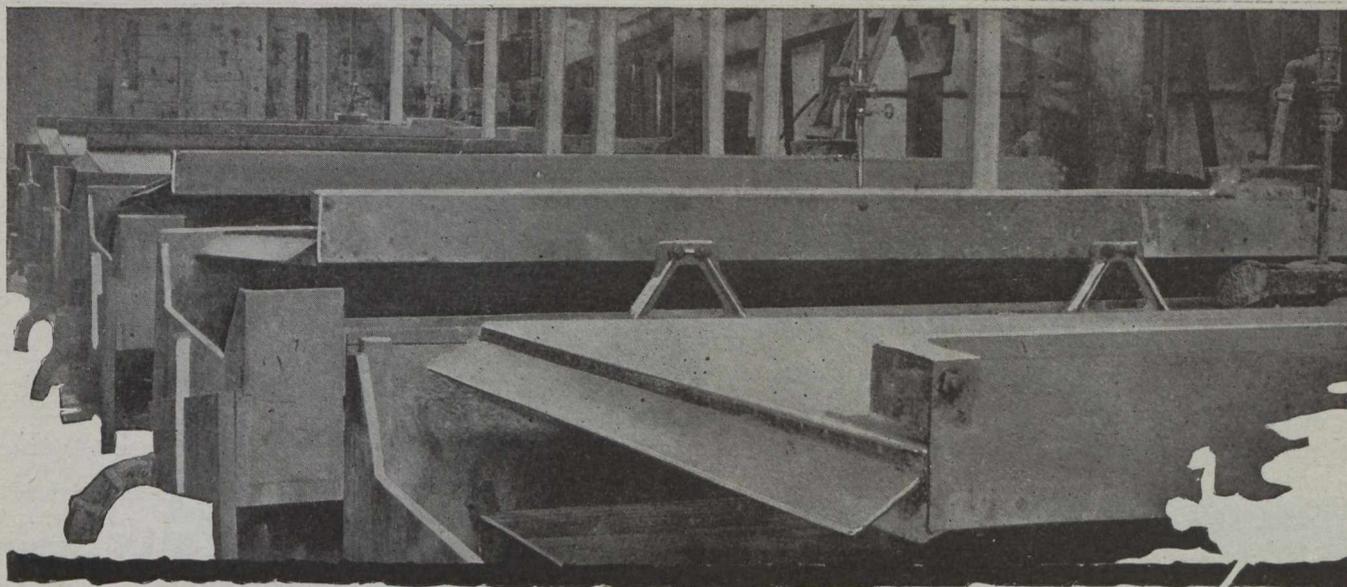
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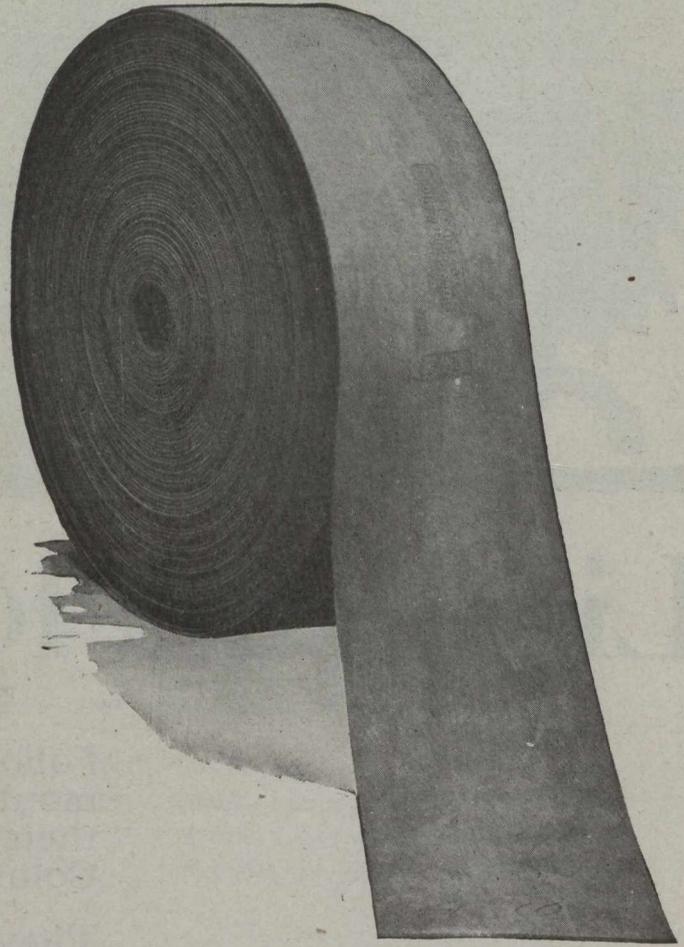
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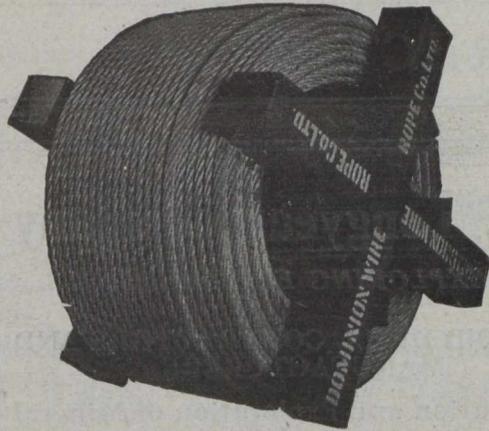
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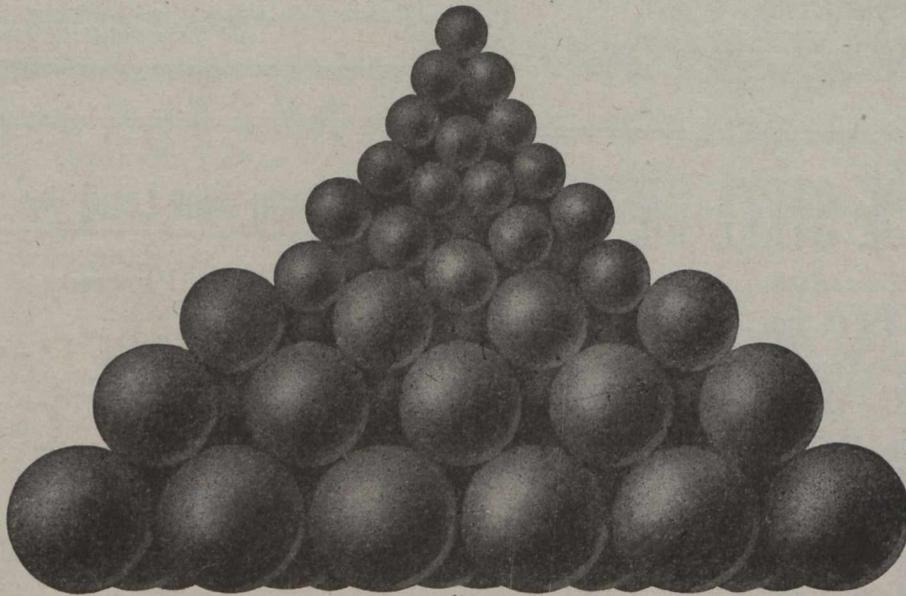
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VOL. XLI.

GARDENVALE, P.Q., October 1, 1920

No. 39

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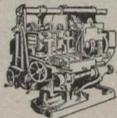
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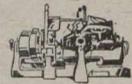
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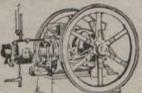
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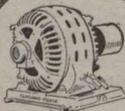
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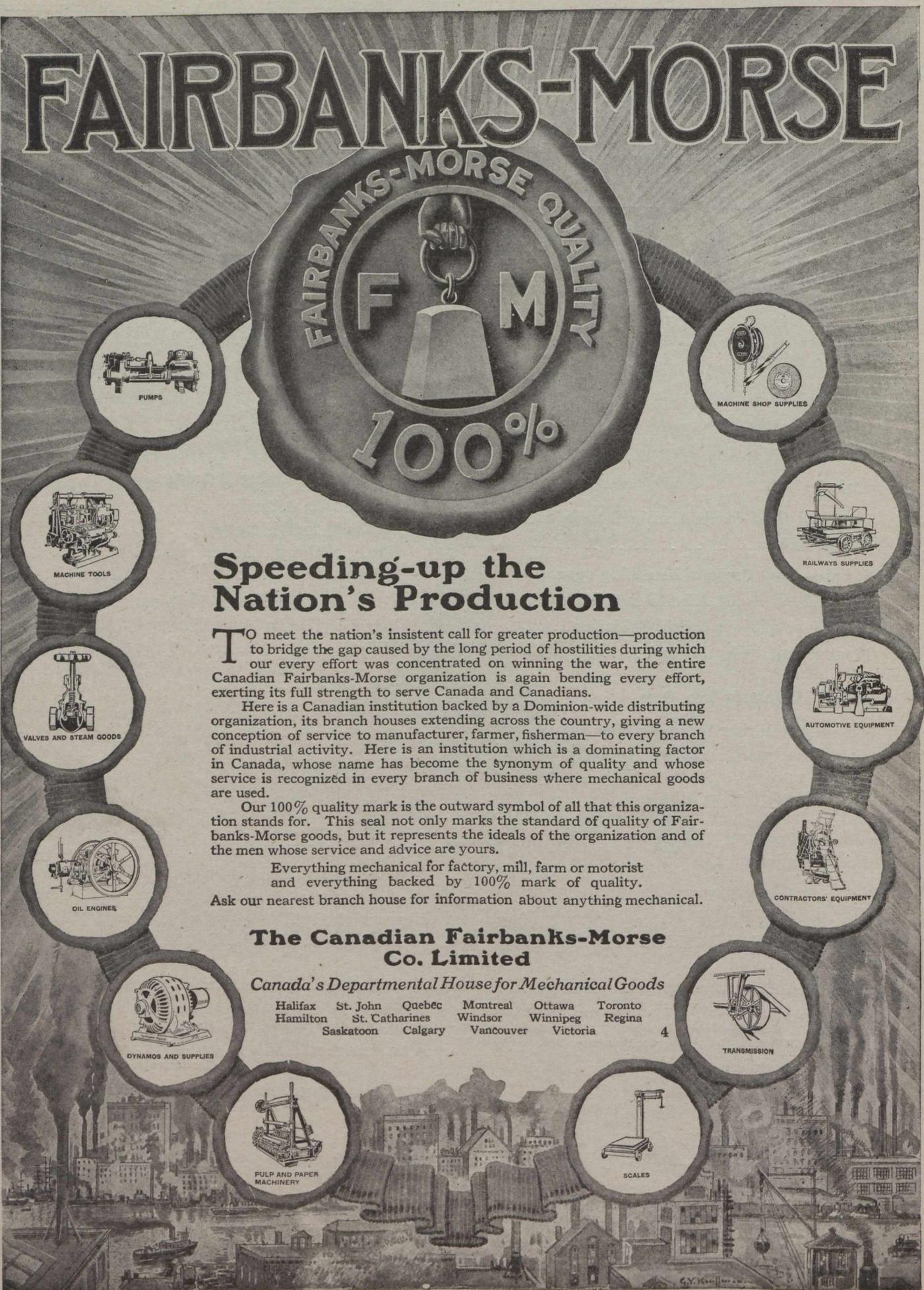
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SCALES



EDITORIAL

Increased Gold Production in Canada a Clear Necessity

The memorandum on "The World's Monetary Problems", prepared by Professor Cassel of Stockholm for the Brussels Conference, now in session, contains matter that is of much interest to the gold mining industry of Canada.

Professor Cassel's main conclusions seem to be two in number, namely, (a) that it is to the common interest of the world to prevent gold from rising again in value, and, (b) that a greater production of gold is required from the mines of the world.

From the viewpoint of the gold miner, these conclusions will occasion some mental perplexity, as they seem irreconcilable in practice.

From the European standpoint, Professor Cassel bluntly states that it is to the interest of all other countries that the United States should not enter on any policy effectively raising the internal value of the dollar, but he thinks it is necessary that one country should take the lead in stabilizing exchanges by fixing the internal value of its money, and this country he believes should be the United States.

The present low value of gold is ascribed to a diminished demand for gold for monetary purposes, due to a general abandonment of gold circulation and the substitution of paper certificates. Withdrawal of gold from circulation, and the disappearance of all definite standards of gold-cover have seriously impaired the value of gold, and if it is to be used henceforth as a monetary standard, special measures to ensure its stabilization are required. Regarding this, Professor Cassel says:

"Stabilization of gold involves, however, special difficulties in connection with its production. If we have a stabilized demand for gold, we must have an annual production corresponding to the general rate of economic progress and sufficient to cover the yearly waste of gold. Assuming the same progress in the years before us as during 1850—1910, we should need at present an annual production of about £100,000,000, increasing 2.8 per cent. annually. The total for the World in 1919 is estimated to be not

more than £75,000,000.

"As necessary annual production would, under the assumed rate, in 10 years be £132,000,000 and in 20 years £174,000,00, danger of a quite insufficient supply of gold is much more imminent than generally recognized."

The increase in the use of gold in the arts, and for articles of luxury is noted, two developments that threaten to absorb a large part of the diminished annual production. Measures to check the industrial uses of gold are suggested, and it is pointed out that the demand for gold from the Far East should be checked by developing Asia's needs for European manufactures.

The insufficiency of the future supply of new gold impresses Professor Cassel to the extent that he proposes measures "not only to prevent monetary demand for gold from resuming its old dimensions", but also a regulation of the consumption of gold as currency, "with a view to reducing it gradually, as growing scarcity of the supply may require."

Most people find it difficult to form a clear idea of the influence of the gold supply upon commodity prices, and we confess to a similar inability, believing that physical shortage of commodities plays a much greater part than the available quantity of the purchasing medium, but it seems clear that economists fear a runaway demand for new gold (should the process of re-establishing the gold standard be unduly hurried) and an upsetting enhancement of the value of new gold.

In Canada, we are chiefly interested in restoring the parity of our dollar exchange with the United States. According to Professor Cassel's reasoning we shall suffer if the United States raises the internal purchasing value of its dollar. This appears to be now happening. To offset this, we have mines that can produce much more gold than they have as yet put out, provided labor is available, and, in view of the prospect that the demand for gold will become more and more insistent, it is to be hoped that our Government will assist by every possible means the augmentation of our gold output.

STANDARDIZED OXYGEN BREATHING APPARATUS.

In suggesting a conference upon the desirability of joint action to secure reliability and uniformity in self-contained oxygen breathing-apparatus, the Minister of Mines for British Columbia has expressed a very general desire among mining men both in America and in Europe. Mr. Sloan advocates the calling of a conference, either at Pittsburgh or Washington, to discuss the possibility of devising an apparatus that could be officially adopted as a standard for coal mines in North America. The United States Bureau of Mines has developed such a type of apparatus, actuated by a desire to incorporate the best ideas, and to eliminate the defects, existing in the patented devices on the market. The time would seem to be opportune for agreement upon a standardized type in the western collieries, where the interchange of international courtesies and co-operative effort in first-aid and mine-rescue movements are much more marked than is the case in the East. In Nova Scotia, it is probable that a European type of apparatus will find most favor, but the keen interest of the western men in first-aid and mine-rescue equipment does not pass unnoticed in the East. Many extraneous and irrelevant matters have been introduced into the choice of oxygen breathing apparatus, and it would be pleasing to see the discussion confined to the ability of any given type to support life in irrespirable atmospheres and to enable men to perform physical work when wearing the apparatus in question. We take it this is what Mr. Sloan desires.

THE "O.B.U." IN THE ALBERTA COAL MINES.

An intimation comes from Ottawa that a strike of coal miners in Alberta, and possibly also in British Columbia, is to be called by the O.B.U. "This is the first time," says the "Ottawa Journal," "that the O.B.U. officials have called a strike openly, and for their own principles."

If it should be that the O.B.U. has called a strike based on political rather than on industrial questions, it will, as was the case in Britain, be foredoomed to failure from the beginning.

The O. B. U. holds that political and industrial questions are one and indivisible, as did Mr. Smillie, but they will probably be taught that strict differentiation between the use of the vote and the use of industrial combinations—whether of men or employers—is one of the main characteristics that has been developed in British ideals of citizenship by our long political evolution. The British people happen to have straightened out their "King and Governor" at a time when the descendants of those from whom some people borrow their political ideals were unlettered savages, and they also happen to have started—either at home or abroad—most of the movements that have led to political freedom.

The adoption of the "closed shop" in the western coalfields, under the direction of the Government, was a step, that, as this periodical has previously stated, may be condoned on the ground of expediency, but is quite indefensible on the ground of principle. Presumably the justification is that the O. B. U. was propagating its communistic doctrine by "boring from within." There need be little trepidation on the part of the Government as to the success which the O.B.U. will meet if it dares to put its theories to an open test by direct action.

The aim of the O.B.U. was well expounded by one of its chief missionaries in Winnipeg recently, who stated: "The O.B.U. is not a national organization. That is absurd. An organization of the working classes cannot be national". Those who regard themselves as Canadians first and foremost will conclude: "Those who are not with us are against us", and will be shy of any organization that makes its first plank the negation of nationality.

It will, at the same time, be a thousand pities if even an abortive attempt of extremists should affect the coal output of the West at this time. Alberta has once again the prospect of leading the provinces in coal production in 1920, and the prospects of permanence in the western coal trade were never so good as just now. Time and time again has Alberta been be-devilled by labor troubles in its coal-mines, which have most definitely reacted to put the Province a long way behind where it should have been in coal output at this date. As we noted in a recent issue, rarely have the government, the universities and the distributors of coal worked together with such unanimity and such prospects of reward as in Alberta, but their efforts have been deliberately annulled by the miners.

CONDITIONS AT NOVA SCOTIA COLLIERIES.

As was noted in the last issue, the Report of the Royal Commission on coal mining operations in Nova Scotia and New Brunswick was constructive in two important points, namely, the recommendation that joint conciliation boards be appointed to adjust labor questions as they arose, and that a sliding scale of increases in wages should be adopted based upon production.

It may be noted that the formation of joint conciliation boards, after the great coal strike of 1893 in Britain, enabled the peace to be kept in coal mining circles for nearly 20 years.

It is also significant that the Royal Commission anticipated the British Government by their recommendation that new wage increases should be based upon production. There seems every likelihood that a solution of the present difficulty in Britain may be found in just such a sliding scale as the Nova Scotia Royal Commission has recommended. The coincidence would indicate that the reasoning of the Nova Scotia Com-

mission was sound. It is therefore regrettable to learn that the United Mine Workers in Nova Scotia, through their locals, are voting against the acceptance of the findings of the Commission chiefly on the score of the two main recommendations above referred to. It is urged that the establishment of the "adjustment board" would limit the powers of the union leaders, and would institute compulsory arbitration, against which the unions are pledged. It is further urged that increase of production is not possible, and that further decrease of production may be anticipated, which, under a sliding scale, would result in a reduction of existing rates of wages.

It is apparent that the unions are not disposed to be helpful in the matter of increased production, and that they do not realize the fundamentally insecure position of an industry which shows simultaneously a forty percent. decrease in production and a greatly increased overhead charge. Neither do the unions appear to comprehend that by discouraging maximum production at this time, when world coal shortage has created panic values for coal, an opportunity to accumulate the capital required for future development of the coal industry is being thrown away.

There is one phase of the coal production question in Nova Scotia that the unions can assist only in part, namely, the replacement of the miners lost to the industry through causes connected with the war, but even in this respect the policy of the union is to discourage rather than to welcome the bringing in of new men from the outside, or to bring about the transference of former miners from the non-producing classes to the coal face.

We surmise that the Commission favored a sliding scale based upon production, not because they found fault with the daily per capita production of the miners employed at the coal face, but because they found the working forces were unbalanced as between producers and non-producers. The Commission doubtless also realized that successive increases to day-paid men created less and less desire among these men to return to work at the coal face, and wished to make the actual miners interested parties in bringing about the transference of men from day-paid positions where they are not wanted—to work at the coal face—where they are very badly needed. We would place the numerical shortage of coal-face workers at approximately the same percentage of the pre-war total force of employees as is borne by the present output to that of pre-war times. That is to say, the decline in coal production as compared with pre-war days is in direct proportion to the numerical shortage of face workers similarly compared.

It is evident that the capacity of the coal operators in Nova Scotia to pay increased wages would be much greater if they were at this time able to market forty percent more coal than is actually the case. The

establishments of the coal companies, in every material instance, could produce, raise, handle, transport and market, forty percent more coal without adding an additional man, if the number of face workers were increased to pre-war numbers. In discouraging a re-establishment of the balance of working forces, the union in Nova Scotia is damaging no interest more severely than its own.

PIONEERS AND "SKY PILOTS".

Although we have been accused of indulging too freely in the foolishness of preaching, the columns of the "Canadian Mining Journal" have not often included the remarks of a Bishop with the excellences of the mining pioneer as his text.

The presence of Bishop Stringer at a Discovery Day celebration at Dawson coincident with the arrival of the first aviators to alight in the Yukon was the occasion of an eloquent tribute to the pioneer of the past, and to his worthy descendants of our own not degenerate age, that makes good reading even at a distance. Bishop Stringer fittingly said he represented "a succession of pioneers older than any other continuous institution in the country". Among the pioneers of Canadian exploration no men have made an earlier or a better mark than the missionaries of the churches, and mining camps—which as a rule mark the frontiers of civilization—have been made better and more habitable places by the labors of men of religion. The spirit that drives the pioneer outwards and northwards is not exclusively the desire of material gain. That instinct plays its part, doubtless, but the prospector and the pioneer are brothers of a craft that are lured by the "sound of the wind on the heath". The result of solitude and of living in the open spaces of the world leads to introspection, and the self-discovery that "there is a spirit in man," which perhaps explains why the pioneer finds himself in closer accord with a bishop than is the case with those who sometimes follow him.

COBALT AND NICKEL, IN THE PEAK OF DERBYSHIRE.

The "Financier" of London contains an announcement from Mr. C. S. Garnett, of Sheffield University, of the discovery of manganese in the Peak of Derbyshire in sufficient quantity to be of much importance to the steel industry of Sheffield.

Mr. Garnett names six minerals he has identified in the Peak District that have not previously been known to exist there, namely Cobalt, diabantite, nephrite, cimolite, utahite (?) native sulphur and allophane.

The occurrence of cobalt is interesting, as it is associated with nickel ore. With the exception of the manganese deposit, it does not appear that any of the minerals newly noted exist in commercial quantities. From a scientific point of view, the occurrence of the minerals identified by Mr. Garnett add to the already great interest of the Peak District to the geologist.

Utilization of Ontario Iron Ores

A New Metallizing Furnace Which Gives a Hot Product Easily Finished in the Electric Furnace.

BY REGINALD E. HORE.

The recently issued report on the production of metals in Ontario in the first half of this year contains much information that is pleasing and some that is not. The Ontario Bureau of Mines has collected statistics which show that the production was larger than in the corresponding period of last year. That it was not still greater was due not to lack of ore, but rather to lack of ability to mine and treat the ore on the scale that the operators hoped. Shortage of labour prevented the producing of the amount of gold that our mines should produce. A dull market for nickel and copper kept Sudbury's great industry from making a better showing. The high price obtained for silver materially benefitted the Cobalt silver mining industry.

It is comforting to note, however, that the foundations for great industries are well laid at Sudbury and Porcupine. Splendid ore bodies have been developed and well equipped for production. The nickel and gold and silver industries will add very materially to the wealth of the Province during the coming years.

But when we read the report on production of iron ore in Ontario, we find little ground for satisfaction with what is being done now or planned for the immediate future. Of the 653,137 tons of iron ore charged to furnaces during the six month period, only 58,387 tons was of domestic origin. Over 90% of the iron used was imported.

There is known to be a large quantity of iron ore in Ontario. It is equally well known that under present conditions it is not profitable to mine much of it. Many of the deposits are small. Others are not of a grade which permits competition with ore from the Lake Superior States. To utilize our ores we must find some method of treatment that can be so advantageously used in Ontario that the shortcomings of the ore deposits may be offset.

Our fuel supply is not such as to give us any help in this problem. We have, however, water powers which might be utilized to such advantage that a real iron mining industry and a larger iron and steel manufacturing industry might result.

How can we utilize our waterpowers to make a profitable mining industry in Ontario? Obviously the mere substitution of electrically generated heat for carbon burning will not get us anywhere. We must get some better process than the ones in use. A process is needed which will more adequately take advantage of the greater facilities for controlling heat derived electrically.

This problem has attracted many investigators. Their work during recent years has been especially appreciated by those who wanted small furnaces for melting purposes. The bigger enterprise, that of making steel from the ore, is now receiving more attention. That this problem has now been solved, there seems good reason for belief. It now remains to be demonstrated.

The Canadian who has devised a process for the economical utilization of Ontario iron ores is Mr. Jas.

W. Moffatt of Toronto, a metallurgist who has been carrying on investigations to this end for several years. He has worked out the process and designed the furnaces. I have obtained from him for the readers of the "Mining Journal" some description of the furnaces and the process. Later I hope he will tell the story himself and go more into the details. In the meantime this article may serve to indicate that the utilization of Ontario iron ores in the near future is not so unlikely as it has seemed. Mr. Moffatt's work gives us some substantial ground for hopes, for he seems to have devised a process and designed furnaces that will make the electric furnace a bigger factor in steel making. I write not as a steel maker, for I never made any, but as one who has learned with interest of the results of the investigator's work. It seems to me that he has accomplished something worth while and I believe readers of the "Journal" will be interested in the work, because of the impetus it may give to our iron industry.

The Process.

The process used is to reduce the iron ore in a metallizing furnace and then without contact with the air and while still hot transfer it quickly to an electric furnace and finish it there. Mr. Moffatt has designed furnaces especially for this work. The accompanying diagrams show the reducing or metallizing furnace. Here the ore is deprived of its oxygen at a relatively low temperature and without fusion. The method of operation is briefly as follows:

Pulverized ore is charged to the retort (5) through hoppers (1) fitted with air tight valves. Pulverized coal or coke for the reduction and subsequent electric furnace work is charged through hoppers (3). The rabblers (7) lift the ore particles and expose them many times to the reducing gas. The metallized product or sponge then falls down on an air-tight conveyer (21) which delivers it hot to the electric furnace.

It will in most cases be necessary to crush the ore to pass 10 mesh. If the ore is porous, however, 5 mesh may suffice. Ores of low iron content must be pulverized until the metallic particles are well separated from the gangue and grinding to pass 100 mesh screen may in some cases be advisable. Magnetic concentration will advantageously be used with some ores. Such concentrates will be ready for the furnace without sintering or briquetting.

To prevent any agglomeration taking place in the furnace and to obtain uniformity of temperature throughout the charge, the mechanical rabbling is kept up continuously from the beginning of the charging to the very end of the discharge. The whole charge is completely reduced and the proper carbon contents obtained before any is discharged.

Most of the heat required is supplied by waste gases. These products are burned outside the retort. The use of much expensive electric energy is thus avoided and at the same time the desired atmosphere in the retort is obtained.

When, near the end of the reduction process the supply of waste gas from the retort runs low, other gas or fuel oil is fed into the outer combustion chamber and the temperature thus maintained. Gas, fuel oil or coal can be utilized as the source of heat at this stage of the process. It is essential that the gases used for the desired chemical reactions and for heat production should be kept apart and this is effectually accomplished.

The perfect control over the metallizing of the oxides makes possible the production of various metals and alloys from their oxides. Nickel and cobalt can be made in these furnaces and the making of nickel steel in Canada from Canadian ores is one of the interesting possibilities.

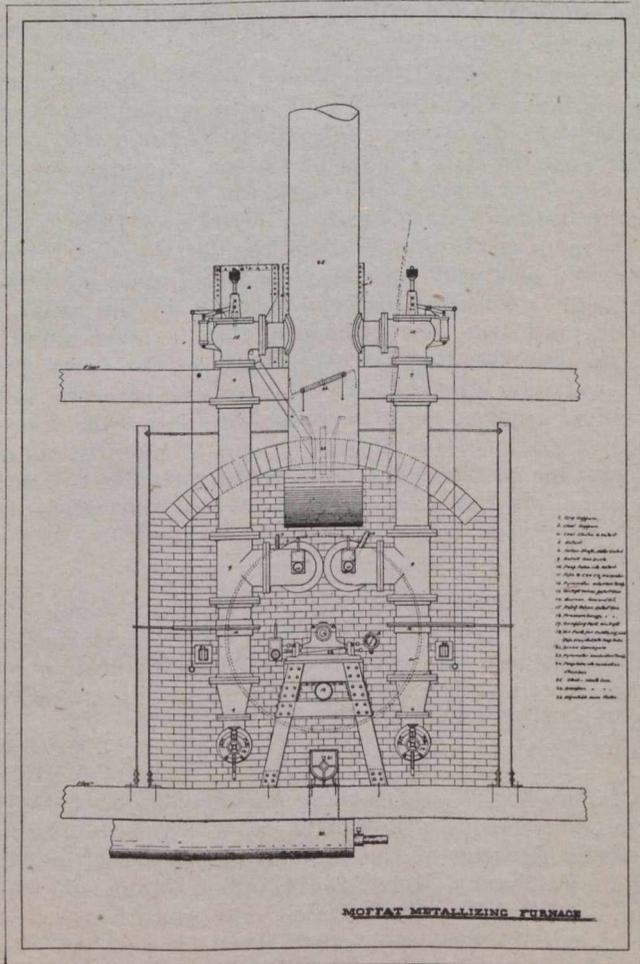
Operation of the Furnace.

In operating the metallizing furnace there will be used an amount of carbon equal to about one third of the weight of the iron in the ore. The charge of ore is preheated in the retort to 250° or 300°C. The carbon is then added in a continuous stream with complete exclusion of air. The retort gives off some gas and the volume increases as the charge warms up. At temperatures between 400° and 500°C the gas is given off most rapidly. The excess carbon, over that required for reduction of the iron oxide, provides a flow of gas richer in carbon monoxide than would be given off otherwise. The furnace operator by reading the retort pyrometer and the gas recorder and consulting his chart is able to accurately regulate conditions in the retort. Towards the end of the operation samples of the charge are taken and analyzed and the carbon feed and temperature regulated accordingly. The thorough mixing of the charge by continuous rab-

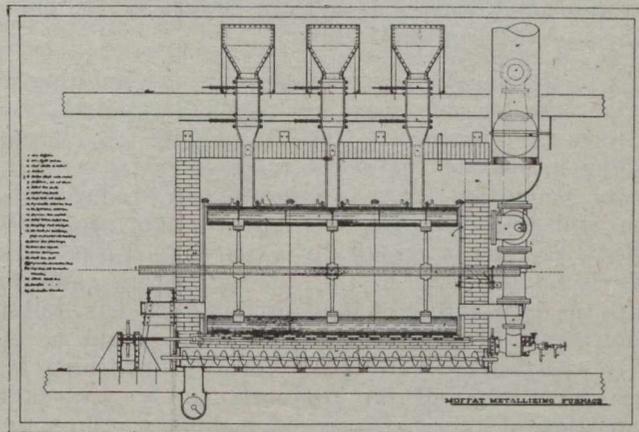
bling permits accurate sampling and the operator has thus the information that will enable him to produce the desired result.

Lime for fluxing is preheated to 250° or 300°C and charged to the metallizing furnace a short time before the sponge is finished, so that it may be heated to the same temperature as the sponge.

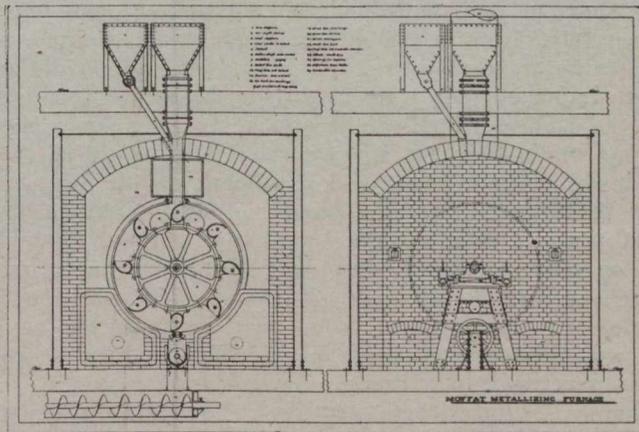
The furnace show in the accompanying drawings is designed to handle a charge of two tons of ore each heat; ore enough to make one ton of metal. Three such furnaces supply the charge for a three-ton electric furnace. The transfer takes only about ten minutes. The electric furnace starts work with a sponge already heated to 600° or 700°C. The time and the additional heat required in the electric furnace is very much less than for a charge of cold scrap.



FRONT VIEW



LONGTIDUNAL SECTION



REAR VIEW AND END SECTION SHOWING RABBLING DEVICE

The electric furnace is thus used where it is especially advantageous — for the high temperature work. In the lower temperature work full advantage is taken of the heat to be obtained in burning the combustion gases. The complete operation of producing steel from ore is affected at low cost and in small plant-units. The cumbersome and costly blast furnace becomes unnecessary. Full use is made of instruments of precision and complete control of the charge is maintained at all stages.

The electric furnace is thus made more suitable for steel making by preparing for it a charge which it is peculiarly well qualified to handle. A reducing furnace specially suited for the making of the iron sponge has been designed. Mr. Moffatt has also designed an improved electric furnace and is working on plans for a complete plant for the production of steel from such ores as we have in Canada.

CANADA AS A PRODUCER OF IRON ORE.—THE INFLUENCE OF COAL LOCATION.

(Bulletin of the C. I. M. & M.)

Perhaps the most important topic discussed at the meeting of the Ontario Mining Association, which was held at Sudbury during the past month, was the deplorable position of Canada as a producer of iron ore, and the status of the domestic iron and steel industry generally. The consensus of expressed opinion was that Government assistance in the beneficiating of Ontario ores to smelter grade is, in principle, highly desirable, and the belief was further expressed that it is commercially practicable to use coal from Alberta in smelting these ores. The outcome of the discussion was the appointment of a committee to present the views of the mining industry of Ontario before the Government Commission now investigating the possibilities of the iron ore industry.

As to the desirability of possessing and building up a vigorous domestic iron and steel industry there is no room for argument. One has only to consider the leading nations of the world to find what a very intimate connection there is between the production of iron and steel and national growth and prosperity. Indeed, the one is practically a measure of the other. This is no less true in the case of Canada, and for years the iron and steel industry has been our leading manufacturing industry. Our position would be entirely satisfactory, were it not for two disturbing factors: practically all the iron ore, and a very large proportion of the coal, used in making our iron and steel is imported; and moreover, the production falls far short of our requirements. To put the case more concretely, iron ore and iron and steel products to the value of one hundred and eighty-six million dollars were imported into Canada during 1918. In the light of the figures there would appear to be a very good *prima facie* case for urging the Government to give material assistance to the development of our own iron ore resources. But one must not lose sight of the fact that an iron and steel industry can not be built up on iron ore alone. A plentiful and assured supply of cheap fuel is essential. Examining the position in Ontario we find there is no coal, and, so far as is known, there are no large high-grade deposits of iron ore—practically all the ore now being raised in the province requires beneficiating. This indeed constitutes one of the reasons for urging Government assistance, in order that the domestic product may compete more favourably with imported ore. The development of the iron mining industry everywhere in Canada is most desirable. But even granting that a bounty might have the effect of encouraging the development of Ontario's iron fields to such an extent that the furnaces could be fed entirely or mainly with Ontario ore, we would still be very far from having a purely domestic and independent iron and steel industry in Ontario. The suspension or cutting off of fuel supplies would be just as serious under such conditions as it would be today.

In this connection, therefore, it is of interest to note that the Ontario Mining Association placed on record their belief that the use of Alberta coal is commercially practicable. It would be interesting to have the data on which this belief is based. If it is well founded, might it not be argued that, if only Ontario ore and Alberta coal were in question, the ore would

be sent to the coal, and not *vice versa*. This at least is a fairly general economic rule, and if it applies in this case we arrive at the curious conclusion that the Ontario steel industry must either disappear, or must continue to rely, as at present, on foreign ore and foreign coal. In other words, it would indicate that, if a large tonnage of iron ore can be developed and produced in Ontario, with or without Government assistance, and if our aim is to establish and build up a really independent Canadian iron and steel industry in central or mid-western Canada, the logical centre for such an industry is in the coal fields of Alberta. However this may be, it in no way affects the general principle as to the desirability or probable effectiveness of the policy of bonusing the production of Canadian iron ores.

TORONTO NOTES.

The Challenger Gold Mining Company, Limited, has been organized and granted incorporation by the Ontario Government, the provisional directors being G. M. Webster, H. P. Rickard and Alexander Miller of Toronto. The capital stock is placed at \$110,000. Another company to be granted a charter by the Ontario Government is the Canadian Casey Cobalt Company, Limited, with a capital stock of \$245,000, the provisional directors being W. W. Perry, C. H. C. Leggott and Edna Fitzsimons, of Toronto.

Another incorporation is the North Country Exploration and Mining Company, Limited, with Montreal incorporators, and a capital stock of one million dollars and head office at Montreal. A company promoted in Ontario is the Ellicott Mining Company, Limited, with head office at Niagara Falls and a capital stock of \$250,000.

Corroboration of the reported gradual improvement in the labor situation as well as in mining conditions throughout the camps of Northern Ontario was given this week by Mr. Frank L. Culver, President of the Beaver Consolidated and Kirkland Lake Gold Mines, on his return from Cobalt and Kirkland Lake where he spent a week on one of his regular tours of inspection. "I was very agreeably surprised upon my trip," he said, "to find a material increase in the ranks of labor, and was also informed that a large number of miners who had left the camp in the early part of the year, drifting into the automobile and ship-building centres, are now returning, and seem exceedingly glad to get back at their old jobs in the mines. With such an improved front mining results will soon be found to far exceed those of any time since the Fall of 1914."

Prof. Stanley N. Graham, who has been engaged in geological examinations in British Columbia during the Summer, has been appointed Professor of Mining Engineering at Queen's University, Kingston, succeeding the late Prof. Gwillim.

Mr. H. W. Welsh, former Manager in Sherbrooke, Que., for the E. & T. Fairbanks & Co. Limited, and latterly Manager of the Scale Department of the Canadian Fairbanks Morse Co. Limited, Montreal, Que., has joined the organization of the MacKinnon Steel Co. Limited, Sherbrooke, Que., as Manager, and has already assumed his duties.

NOTE ON OCCURENCE OF TETRAHEDRITE IN EAST KOOTENAY DISTRICT, BRITISH COLUMBIA

Some notes on Tetrahedrite or Grey-Copper-Ore have been published by William Thomlinson, of New Denver, B. C. They have special reference to the ores of East Kootenay and are of special interest to prospectors.

He says:

Of the various minerals which the prospectors and miners of the Kootenays are daily coming into contact with, the mineral Tetrahedrite or Grey-Copper, appears to be, in many cases, the least understood.

Most of the men referred to are quite aware that for some reason grey-copper-ores are very variable, especially as to silver contents; but few persons appear to know that the mineral has such a variable and wide range in its composition.

Tetrahedrite, or grey-copper, being, I believe, the principal silverbearing mineral found in Kootenay ores, the following notes are given with the aim to benefit our local miners and others who may desire to have a fuller knowledge of the mineral, its varieties, variations in composition, and its usual modes of occurrence.

Sometimes is Rich in Silver.

Tetrahedrite or grey-copper, in all its varieties, is known to most prospectors and miners simply as "grey-copper," but to some persons it is still known by the old German name of Fahl-erz (grey ore), and in recent books on mineralogy the silver-rich variety, such as occurs so frequently in this district, is called by the special name of Freibergite; while a somewhat rare variety, in which arsenic supercedes antimony, is known as Tennantite.

Unlike, most minerals, which have definite or exact chemical expositions, the so-called grey-copper-ores have a wide range in their make-up, and may, I think, be considered more as mixtures of various elements than as definite minerals.

Recent authorities on the subject state that the following elements have been found, in varying amounts, in the several varieties of tetrahedrite, viz.—copper, silver, antimony, arsenic, sulphur, iron, zinc, lead and even mercury.

Apparently as a starting point, mineralogists have given to tetrahedrite proper the formula or composition of (by atomic weights), copper, 8 parts, antimony, 2 parts, and sulphur, 7 parts, omitting the silver and other elements entirely. This formula, for tetrahedrite proper, gives a composition of about, Copper, 52 per cent., antimony, 25 per cent, and sulphur, 23 per cent.

Tetrahedrite, when found of this or nearly of this composition, usually takes the form of four-sided crystals known as tetrahedrons, hence the name tetrahedrite.

Kootenay Ores are Generally Massive.

Now, having obtained a starting point, I shall try to show where some of the many variations come in; but, as a preliminary, may here state that the crystallized variety, composed entirely of copper, antimony and sulphur, is rarely, if ever, met with by the prospectors of miners of this part of British Columbia.

The grey-copper-ores found in the Kootenays are generally found massive, compact, or without any crystalline structure, and occurring as films, veinlets, bunches, masses, or as finely disseminated particles;

associated with the local ores containing galena, zincblende, chalcopyrite, pyrite and other minerals.

In the grey-copper found associated with Kootenay ores, much of the copper content of the mineral is apparently replaced by varying but considerable amounts of silver, therefore, this variety of grey-copper may properly be classified as freibergite.

In Kootenay ores, showing grey-copper, the silver contents may range anywhere between 50 ounces and 5,000 ounces of silver a ton of ore, according to the amount of richness of the grey-copper in the ore.

According to Dana, an examination of a large number of specimens of tetrahedrite showed that the various elements composing the same ranged in amounts about as follows, viz.—

Copper from 14 to over 40 per cent; silver from a trace to over 30 per cent; zinc from none to over 7 per cent; iron from 0.05 to over 8 per cent. Sulphur varied greatly and antimony and arsenic generally replaced each other in part or altogether.

Although high percentages of copper may be found in specimens of tetrahedrite, the mineral is seldom classed as an ore of copper; it is generally more valuable as a silver-bearing mineral, especially in the ores found in the mining camps of this district.

Grey-copper alters readily when exposed to air and water or to vein solutions, forming secondary minerals such as the green and the blue carbonates of copper and the blackish powdery oxides and other mixtures found in the oxidized portions of veins.

Some miners, not understanding these secondary minerals, call the copper carbonates "bromides" and "chlorides" of silver, and the black powdery material is often referred to as the "sulphides" or "sulphates" of silver.

May be Mistaken for Other Minerals.

The compact or massive variety of grey-copper may be mistaken for arsenical iron or arsenopyrite; for copper-glance or chalcocite; or for brittle silver or stephanite.

However, arsenopyrite is much harder than tetrahedrite and it also gives strong reactions for arsenic and iron.

Chalcocite is softer than tetrahedrite and being less brittle cuts more smoothly, besides it does not give reactions for antimony, arsenic or silver.

Stephanite does not react for copper or arsenic.

Gives Guides to Recognition.

The following hints may aid in the recognition of grey-copper-ores when met with:

The crystalline variety, tetrahedrite proper, takes the form of four-sided crystals, known as tetrahedrons.

The silver-bearing varieties, freibergites, such as are found in the Kootenays, are usually compact, massive, or granular; although altered forms may be met with having a powdery or even earthy appearance.

The mineral is from 3 to 4 hardness and is somewhat brittle.

The color ranges from light grey to dark grey, and in rare cases to iron-black; the streak or powdered mineral being usually of the same color as the crude mineral, but a certain rare variety may give it a reddish-brown streak.

A test piece, before the blow-pipe, pops or breaks up but the mineral powdered and slightly roasted fuses easily, giving off fumes of arsenic, sulphur, etc., and

in most cases, gives a bead of metallic copper or copper and silver.

Simple chemical tests may be made as follows:

Powder the mineral and dissolve it in warm nitric acid. Take half of this solution, and add some ammonia, when, in the case of a grey copper ore, you will obtain the blue color, indicating the presence of copper.

If you put a clean knife-blade or clean iron nail into the blue solution, metallic copper will be precipitated onto the blade or nail.

To the other half of the original solution add some hydrochloric acid (muriatic acid) or a little common table salt (sodium chloride) when in the case of silver-rich grey copper or freibergite, a cloudy curdy mass of whitish grey chloride of silver will be precipitated. This can be collected, washed, dried and reduced to metallic silver before the blow-pipe or otherwise.

Advise Determination by Fire Assay.

However, in conclusion, it may be well to emphasize the fact that the silver content of grey-copper-ore may vary greatly in the different mining camps or districts and vary considerably, even in the different mines of a camp; therefore before making a decision regarding the silver content of any sample or specimen of tetrahedrite or grey-copper-ore, be sure to allow a reliable assayer to first determine the amount of silver by cupellation or fire assay.

NOTES FROM THE NOVA SCOTIA COLLIERIES. New Collieries.

Preparations are being made by a number of interests in Cape Breton to increase the capacity of the coal areas for output, and much capital expenditure is projected.

The most extensively worked coal seam in the Sydney Field is the Phalen Seam, underlying which is a seam of good quality averaging about 4 ft. 6 ins., in thickness known as the Emery Seam. This seam has been opened at three points, namely at the Dominion collieries Nos. 10 and 11, and a new colliery No. 24. The territory of Emery Seam tributary to these collieries approximates respectively to the worked out territory of the Phalen Seam above at the older collieries Nos. 5, 3 and 4 (Reserve and Caledonia areas). It is now proposed to tap the Emery underlying the Phalen workings in Nos. 1 and 2 collieries, which will eventually mean the mining of the Emery Seam under the entire land area of the Glace Bay District, and its ultimate extension to undersea areas, following the history of the three exhausted seams above, to wit, in order of occurrence, the Hub, Harbor and Phalen Seams.

The percentage of Emery Seam in the production of the Glace Bay District is now around twelve per cent, but with the new openings projected, it may be anticipated that this percentage will rapidly increase. The Emery coal is a strong coal, with a light-colored flocculent ash, and is easily washed. It has been largely used for metallurgical purposes, and is in much favor as a locomotive and bunker coal. It will give up to 14,000 b.t.u.'s.

The Dominion Coal Company has entered upon a programme to develop what has always been its largest and most stable coal asset, namely, the large virgin areas of coal underlying the Phalen Seam. As the seams in the Glace Bay district crop concentrically, the seams increase in content under the land area as they are tapped at lower depths, and it is impor-

tant to note that under the Emery there is known to exist at least three workable seams, each having a larger land extension than the seams lying above.

A feature that favors the development of the lower seams is that the surface equipment and housing accommodation which has served the upper seam collieries is available for working the lower seams, in large part.

A similar succession of lower seams is to be found in the Waterford District, where as yet, only two upper seams have been worked to any extent.

In the Morien District, there is at least one, and probably two seams underlying the two collieries now working. The coal in this rather small field in the underlying seams is of good quality, very accessible, and capable of being worked relatively cheaply for that reason.

An unconfirmed report states that the English directors of the Cape Breton Coal Iron & Railway Co., which owns the Broughton Colliery in the Morien Basin of the Sydney Field, contemplate resumption of mining operations.

It is understood the Dominion Steel Corporation has discontinued the search for iron ore in the Loch Lomond District, Cape Breton. The ore, as found is of good quality and desirable for mixing with the Wabana ore, but diamond drilling has proved the occurrences to be discontinuous and unadapted to economical extraction in large quantities.

There is a small synclinal basin in the Loch Lomond district which contains coal seams of limited extent, but of quite good analysis. At the present time, lack of a railway, and the ability of the larger companies to mine coal more cheaply from more favorably situated areas, renders the development of this field unlikely, but it is one of those deposits that is of value as a reserve against future requirements.

The Nova Scotia Steel Company, it is understood, is undertaking the development of a small land area on the Collins Seam, with a view to seaward extension on a larger scale if market demand and other conditions should warrant this at some future time.

A large scale development of the Stubbert Seam on Boularderie Island is contemplated, and a railway some six miles in length, connecting with the Canadian National Railway will be required to connect with the site of the projected colliery.

This new colliery, together with important seaward extensions proposed by the Dominion Coal Company, depends for full realisation of all its possibilities upon the combined operation of the properties of the two companies under financial consolidation. The physical consolidation of the interests of these two companies, so far as the coal areas are concerned, is virtually consummated, to which fact some of the most hopeful developments of coal mining development in the Sydney Field are distinctly traceable.

Labor and Wages.

The various locals of the United Mine Workers are, one after the other, expressing dissatisfaction with the award of the Royal Commission, and in particular they ask for the increase in wages to be retroactive to May 1st instead of July 1st, as recommended by the

Commission. The disbursement which will be required to make this retroactive payment from July 1st is a very large one, probably reaching for the three months ending September 30th the sum of \$800,000. Under the recommendation of the Commission, this huge sum is to be paid out for work already done, covering a period when production has been most unsatisfactory, and overhead expenses altogether disproportionate to the rate of production. What is still more disturbing to the coal operators is the entire disagreement expressed by the miners with the recommendation of the Commission that a sliding scale be adopted designed to make the remuneration of the workers correspond to some extent to the rate of output.

The extra expenditure entailed upon the coal companies should the full recommendations of the Commission be followed in regard to wages and housing improvements, are not less than stupendous, and in actual practice will certainly be found impossible of fulfillment.

Mine Illumination.

The Royal Commission makes the following recommendation with regard to Electric Lamps :

“The Commission recommends that where practicable electric lamps should be installed by the operators as a means to greater efficiency and larger production, instead of the so-called safety lamps, but the advisability of the collateral use of the safety lamps should be borne in mind for the presence of the detection of the presence of gas, that is to say, an occasional safety lamp should be available and easy of access to parties of men working in places where gas is likely to make its appearance, and that the advisability for making the tests should be kept prominently in mind.”

Without any desire to speak disrespectfully of the Commission, this statement from a body of non-technical men regarding one of the most hotly contested features of mining practice, is a little too positive, and trenches upon the jurisdiction of the Coal Mines Regulation Act and those officials of the government whose duty it is to see that these Regulations are carried out. The implication that the desires of the workmen and the operators, based upon “greater efficiency and larger production” are all that is necessary to authorize a change in mine illumination was probably not intended, but some acknowledgement of the functions of the Department of Mines, and some stress upon the primary consideration of safety of life should have been made by a Commission that included no men with technical training in coal mining.

Coal Export Embargo.

Lifting of the coal export embargo is expected at the closing of St. Lawrence navigation. As the chief reason for imposing an embargo was to divert coal to St. Lawrence ports—which it has not done—there will be little reason to continue the prohibition on exports. Special consideration is being given by the Nova Scotia collieries to the requirements of Newfoundland. At the present time the coal production of Nova Scotia is not more than sufficient to fill the requirements of the coal consumption of the steel works and the domestic and manufacturing requirements of the Maritime Provinces and Newfoundland. There is a possibility, unless labor troubles intervene, that coal outputs will improve in October and continue at higher than Summer production rate until the Christmas holidays.

THE TIN DEPOSITS OF VIRGINIA, U.S.A.

BY MARSHALL HANEY. #

Tin has been known to exist on Irish Creek in Rockbridge County, Va., since 1840. Professor Armstrong, of Washington College tested the tin ore from this locality in 1846 and stated that the specimens he tested contained tin and silver. At this time only a few prospect pits had been opened.

Since 1885, a great deal of prospecting has been done along the eastern edge of Rockbridge County parallel to the Blue Ridge Mountains from a few miles north of the James River into Nelson County. The most favorable portion of the area prospected is known as the Irish Creek area located in the northeastern corner of Rockbridge County about 7 miles from Vesuvius, a station on the Norfolk and Western Railway. A company was organized in 1883 for the purpose of working the tin deposits of this section and the first work was done in 1884. The Irish Creek area is about 4 miles long and 3 miles wide.

Occurrence of the Ore

The rocks of the Irish Creek area are crystalline of granitic composition; in places the rock is porphyritic, the felspar crystals measuring an inch or more in length. The granitic rock is much decayed at the surface forming a clayey mass about 50 feet thick. Dikes of diabase cut the granite rock in all directions and are frequently associated with the veins of tin ores. The tin ore is found in well defined quartz veins which cut the granite in all direction and have steep dips. The veins are banded and carry pyrite and arsenopyrite in addition to cassiterite. Generally the veins are not over one foot thick and the tin occurs as crystals nodules and stringers. The gangue is quartz with some pyrite and mica. The location and character of the veins have been proved by many openings usually very shallow. Many of the veins are rich. Numerous nodules of pure cassiterite, the size of a hen's egg are found. The Cash Mines are the best developed prospects in the area.

Mines.

Boston capitalists obtained control of The Cash Mines in 1890 and in 1891. They erected a \$50,000 mill to concentrate the ore and at the same time they had 300 tons of 3.3% ore on the dumps. They concentrated enough of this ore to get 250 pounds of concentrates which yielded 43% tin. The vein from which this ore was mined runs from 6 to 8 feet wide. The veins have been exposed in about 40 places and vary in width from a few inches to 8 feet and the ore runs from 1% to 13% metallic tin. This section offers superior advantages for profitable tin mining. The veins compare very favorably in character, extent thickness and richness in metallic tin to those of the famous Cornwall district, England.

Consulting Mining Engineer, Geer, Greene Co., Va.

The use of the word “datal” in the Nova Scotia Royal Commission's Report is quite frequent. The word is of Old Country origin, and should actually be “day-tale”, the corrupted word “dataller” being applied in Britain to a man paid by the day. This use is altogether confined to mining operations. The term “day-paid” is to be preferred.

British Columbia Letter

Stewart, B. C.

That the Salmon River Section of the Portland Canal Mining Division, northern British Columbia, has gone through its boom stage and that there now is in progress much development and prospecting that promises good results are statements credited to Dr. S. J. Schofield, Ph. D., late of the Canadian Geological Survey and now Professor of Geology with the University of British Columbia, who has returned after a season at the head of a Geological Party in that region. He has been engaged in the completion of work commenced in 1919 by J. J. O'Neill, who recently severed his connection with the Geological Survey of the Dominion. The results of Dr. Schofield's researches will be contained in a report to be issued by the Canadian Department of Mines in the course of a few months. He observes, however, that it was notable that much of the ore being taken out of this new and rich silver camp is of a complex character, containing considerable lead and zinc. The Premier Mine was the only property being worked at the time of Dr. Schofield's departure and on it a Mill was being constructed to handle low grade ore. Shipments will be made during the Winter, the snow providing a comparatively easy method of transportation over the thirteen mile trail to tidewater. There were employed about 150 men. Prospectors, he said, were getting good results in the Salmon River District and considerable attention was being devoted to the Bear River area. During the season the work of the geologists was interfered with to some extent by heavy rainfalls and about the time they left snow was beginning to appear on the surrounding hills.

The New Alaska Property is expected to be opened up this winter. It is stated in the Portland Canal District. The showing on this group of claims is good and it is announced that, with the necessary capital available, development will be carried forward briskly.

A small gang of men has been working recently on the property of the Fish Creek Mining Co., located on the Alaska side of the boundary, Salmon River District, Portland Canal. A four foot vein of galena has been uncovered, the values of which are such as to encourage the owners in the belief that the prospect will ultimately become one of the permanent shippers of the camp.

Work on the Silver Tip, Salmon River, has been closed down and there will be no permanent camp this winter. For some time a considerable force has been engaged in stripping and preliminary surface operations, the results of which are reported to have been satisfactory. Stringers of high grade silver have been disclosed and it is planned to continue development next year with a view to the establishment of greater veins with more promise of substantial returns.

Prince Rupert, B. C.

While passing through Prince Rupert a few days ago H. S. Munroe, General Manager of the Granby Consolidated Mining and Smelting Company, made the statement that his Company ships fifteen cars of copper a week and that there was no reason why this should

into all pass though the Pacific Coast Terminal of the Grand Trunk Pacific Railway. Mr. Munroe said that the Company would like to ship five or six cars a week by this route right away. The output of Anyox would be increased, it was asserted, as soon as the price of the metal went high enough to make it profitable. The low quotations of the present had resulted in a policy of manufacturing just sufficient to keep the plant in operation, the production at present being about 2,500,000 lbs. a month. With better market conditions this could be increased without difficulty to 3,500,000 lbs. a month.

Referring to the Granby Company's property, the Midas, situated near Valdez Peninsula, Alaska, Mr. Munroe said that this would be made productive as soon as there was a stronger demand for the metal. The ore was of high grade. It would be concentrated and shipped direct to the Tacoma Smelter:

In the course of a visit to Grand Forks, B. C. where the Granby Company has a smelter which has been inactive for the past several months and where, among the residents, there has been much speculation as to the Company's intentions, Mr. Munroe gave the municipal authorities the assurance that the smelter dam and lake will remain as at present at least for some time. Mr. Munroe inspected the mines at Phoenix as well as the plant there and at Grand Forks. He was reticent regarding the Company's mining policy in the Boundary, leaving the impression that not much could be expected while the copper market remained weak but that ultimately it was possible that a concentrator would be erected somewhere in that section of the Province.

Trail, B. C.

The Nettle L. Mine, of the Lardeau, and the Payne, the latter being a former large producer of the Slocan Camp, figure among the shippers to the Trail Smelter, Canadian Consolidated Mining and Smelting Co., during the week ended September 7, 1920. The total ore receipts at the Smelter for that week total 7718 tons, making the aggregate for the year up to that date 224,367 tons.

Kaslo, B. C.

While there has been comparatively little development on new properties in the Slocan Camp in recent months lessees, working on well-known mines for long inactive are getting good results in many cases. Working on No. 1 Level of the Washington Mine, near the Rambler-Cariboo lessees recently sent a carload of galena ore over the Rambler-Cariboo tramway which had been taken out in three weeks and which averaged more than 150 ounces of silver to the ton and 65 per cent. lead. The indications were such as to lead to the confident belief that another carload can be taken out in a similar period. At the same time lessees on the No. 3 Level of the Rambler-Cariboo are said to be working in rich ore. A part of the Whitewater Mine also is being worked under lease and it is authentically reported that the operators have shipped two carloads of ore from a newly uncovered body which has brought large returns. This work is close to the Wellington Mine where No. 2 tunnel level is being reopened by the Standard Silver-Lead Mining Co. Labor conditions are improving in this District, applications being received for work and a considerable number of men being granted employment.

The Payne Mine, one of the first locations in the Slocan, is under bond and lease to a Seattle Mining Syndicate. A long lower cross tunnel opens the property to a depth of 1500 feet but little exploration of the vein at that level has been attempted. Above No. 5 Level the mine has been largely worked out but below there is a large area that may be expected to contain ore. The mine showed an oreshoot 1200 feet long in the early days extending down to the fifth level from the surface.

Hope, B. C.

The re-opening of the Emancipation Mine, near Hope, is assured. Plant to the value of \$20,000 has been installed and it is expected that the first shipment of ore will be made next month. Dr. E. T. Hodge, the manager, states that the ore is of high grade, running up to \$303 a ton. The vein is from 5 to 25 feet wide and proven over the length of two claims.

Vancouver, B. C.

All phases of the mining industry of British Columbia were represented in an exhibit presented by the B. C. Chamber of Mines at the recent Vancouver Exhibition. There was copper ore from the Britannia and Granby Mines as well as specimens of the concentrates and the tailings. Ores and concentrates also were present from the Surf Inlet Mine while the Dolly Varden, of Alice Arm, was represented by fine samples of both native and ruby silver. Specimens of copper ore from Spence's Bridge section and samples of the ores of the Kootenay were shown. There also were a number of beautiful examples of British Columbia's product in rough and polished marble.

Accounts are being received regarding activities in the Mayo District, the new silver camp near Dawson, Y.T., from miners and prospectors who are coming south for the winter months. They say that Mayo City, 150 miles south-east of Dawson, on the Stewart River, bids fair to become a "city of tents" because of the rush to that point of miners intent of making locations. The Guggenheim interests, it is stated, have taken in large quantities of plant and supplies and are engaged in operations in Keno Hill, it being planned to take out 3,000 tons of ore this winter. On Lookout Mountain the Yukon Silver Lead Co. are 450 feet down on the vein with a large body of concentrating ore in sight. It is stated that the old prospectors, who went out of the country during the war, are back and are busily engaged in their work and in staking the promising mineral showings.

PROFESSOR RUSSELL'S NEW APPOINTMENT.

Mr. J. W. Russell, M.A., of the staff of Woodstock College and manager of Oxford Cobalt Mining Company has been appointed professor of geology at the Western University, London. Mr. Russell is an honor graduate of McMaster University and was a graduate student at Harvard. He taught for a couple of years in McMaster University and has also taught in a number of collegiate institutes in Ontario. For a number of years he has been engaged in mining in Cobalt. In spite of his activity in the practical field, however Professor Russell has been in constant touch with educational work. His new appointment will in no way interfere with his duties as manager of the Oxford Cobalt mine.

JOSEPH PAXON IDDINGS.

A Profound Student of Petrology.

In a recent issue of "Science" the death is announced, at the comparatively early age of 63, of Joseph Paxon Iddings, formerly professor of petrology in the University of Chicago and at one time a geologist of the U. S. Geological Survey. Mr. Iddings became a member of the staff in Chicago in 1892, at the time of the organization of that geological department which has had such a great influence on the science through its students and the writings and research work of the members of the staff. The work of Chamberlin, Salisbury, Penrose and Iddings, all original members of the staff, has done, at least, as much, it is safe to say, to advance the science during the last thirty years as that of any other four men throughout the world.

During the closing decades of the last century, petrology, or as it was more commonly called petrography, was probably the most popular branch of geology among post-graduate students. The microscopic study of rocks in thin sections was really founded by an Englishman, Sorby, but like certain other sciences was developed in Germany. Heidelberg and Leipzig attracted practically all students of petrography from North America until G. H. Williams began his distinguished career as teacher and investigator on the staff of Johns Hopkins University, ending with his untimely death in 1894. Iddings' professorial work in Chicago continued until 1908. Through their teaching Williams and Iddings exerted a profound influence on petrography. After they took up professorial work it was no longer necessary to leave North America for the best instruction obtainable in this specialized subject.

Iddings' epoch-making work on the rocks of the Yellowstone National Park and his books on Rock Minerals and on Igneous Rocks will serve as lasting memorials to his too brief career. The passing of his contemporaries at early ages, George H. Williams, J. Francis Williams and, more recently, L. V. Pirsson, deprived petrography of profound students and investigators.

The Quantitative Classification of Igneous Rocks, the joint production of Cross, Iddings, Pirsson and Washington, has done much to make petrography a more exact science.

The igneous rocks have come to be recognized as the most important factors in the genesis of metalliferous deposits. Much of the research work of men like Iddings might appear to be of an abstract or academic nature, but, as in the case of other sciences, the study of the pure science has had a far reaching effect on the applied.—W. G. M.

Toronto, September 23rd.

The Nova Scotia miners request of the companies that when two men are compelled to do the work of three men that they receive time and a half. The operators reply "two men cannot do the work of three men". Nevertheless it has been done. Conversely it may be noted that when enlistments took away the younger men around the mines, it often took two men to do a boy's work, and this does not reflect on the men. Agility and youth are requisites in some phases of mine employment.

Northern Ontario Letter

THE SILVER MINES.

The Cobalt Field.

A quite serious shortage of labor exists in the mines of Cobalt, especially among the unskilled workers. Muckers are decidedly scarce, and working forces in some instances are more than ten per cent below requirements. Added to this adverse factor is the recent increase in freight rates, the two combining to create a situation which is believed will surely reflect upon the cost of producing silver.

Offsetting the adverse factors is the continued high price of silver, quotations ranging around 94 cents an ounce in New York funds, and thus working out at about \$1.04 an ounce in Canadian currency. This leaves all the leading mines with a safe margin of net profit.

The Nipissing, Coniagas and Kerr Lake are believed to be holding costs down to less than 50 cents an ounce, while at such mines as the McKinley-Darragh cost is understood to have risen to about 80 cents, with an even higher cost at the La Rose.

While these costs are very high as compared with earlier years, yet the price of silver is actually about 50 cents an ounce higher than at the time the low costs ruled. This removes any cause for alarm in this respect.

On October 31st, the Coniagas mine will close another favorable fiscal year. An average of about 500 tons of ore is being treated daily, about 100 tons of which is being treated by cyanide process in the leased equipment in the Buffalo mill. Mill heads are understood to average between 8 and 10 ounces of silver to the ton, as compared with 13.07 during the previous year, and this is believed to indicate an increase in costs to not far under 50 cents an ounce as compared with between 42 and 43 last year. As regards the next fiscal year, the mine will be equipped to handle an extra 100 tons of ore daily, and in this way the output is expected to be well maintained.

A meeting of the shareholders of the Temiskaming Mining Company has been called for October 7th, for the purpose of considering a proposal to join the McIntyre-Porcupine Mines in carrying out the purchase of coal lands in Alberta. The Blue Diamond Coal Mines, Ltd., of Brule, Alta., is capitalized at \$1,500,000, while the Canadian Coal Fields, Ltd., is capitalized at 10,000,000. The deal in which the Temiskaming shareholders are asked to participate involves both properties.

During the work of excavating for a foundation for the installation of a crusher at the dumps of the Kerr Lake mine, a narrow vein has been opened up in which native silver occurs. The vein is one which is believed to have been cut underground at a depth of 90 feet, but at this point it did not contain silver. Despite the over-burden of about eight feet of sand and gravel, the vein will be further opened up at surface.

Action has been dismissed in connection with the application of a shareholder of the Bailey Mine to order the company to make reasonable provision for transfer of shares to beneficial owners thereof, and for their registration as shareholders prior to the general meeting of shareholders to be called pursuant to order of 28th June, last.

The McKinley-Darragh is experiencing difficulty to earn its dividend requirements at the rate of 3 p.c. quarterly. However, with net profits not far below requirements of a little over \$67,000 quarterly, and with a surplus at the beginning of the year amounting to over \$365,000, it is generally believed the surplus will be drawn upon to the extent necessary to pay the present rate for considerable time. Drawing on this surplus to the extent of one full quarter for each year, it would last five years.

Two carloads of medium-grade ore have been shipped from the old Ruby Silver mine situated in the south-eastern part of the township of Bucke. The property is being worked by the McDonald Syndicate, of which the following local men are members: Kenneth McDonald and E. J. McMillen, Haileybury; Chas. Johns and E. Lapointe, North Cobalt, and C. H. Moore and J. J. Anderson of Cobalt.

The vein recently encountered at the 350-ft. level of the Keeley Silver Mines in South Lorrain is said to be that known as No. 9. It is about 14 inches in width and contains from 200 to 400 ounces of silver to the ton at the point where cut. The cross-cut at this level has about 35 feet to go before reaching the point where the "Beaver Lake" vein is expected to be encountered. On an upper level of the last mentioned vein, an ore about 170 feet in length has been opened up in which high milling values, said to average over 40 ounces to the ton, occur over a width of from three to four feet. The 20-stamp mill is expected to be ready for operation on the Keeley by the end of November.

Because of the success on the Keeley, English interests are paying considerable attention to mining prospects in South Lorrain, and the opinion is expressed that aggressive work may lead to the development of profitable mines in that area.

Elk Lake Area.

A summary of mining news from Elk Lake is as follows:

Silver has been encountered on the recently opened Regent Mines, in the township of James. The property is being equipped with camps and with a steam-driven mining plant.

Members of a Cleveland Syndicate are engaged in examining various properties in this area with a view to obtaining working options, and two or three such deals are pending.

The seizure of ore of the Reeves-Dobie mine in course of shipment, as reported previously in these columns, consisted of 213 bags of concentrates, said to be valued at about \$100 a bag, and followed a judgment against the company for wages and an assignment.

Encouraging gold assays have been obtained from a vein discovered in the township of Bryce, and Elk Lake prospectors have staked a number of claims in that district. Mr. Burrows, Ontario Government geologist, has concluded a visit to that area.

Ore Statement.

Following is a statement of ore shipments over the T. & N. O. Ry, for the month ending Augst 31st. In tons of 2,000 lbs.

SILVER ORE.	
Cobalt Proper	Tons.
1. Coniagas	66.10
2. Dominion Reduction	33.00
3. Hudson Bay	30.13
4. LaRose	85.18
5. McKinley-Darragh	210.19

6. Nipissing	898.99
7. Northern Customs	32.30
8. O'Brien	64.08
	1,419.97

The above shipments were made to the following Companies :

Canada	
Deloro Smelting & Reduction Co. Deloro	
Marmora	1,207.62
Coniagas Reduction Co., Thorold	32.50
United States.	
American Smelting & Refining Co., Pueblo..	96.03
American Smelting & Refining, Perth Amboy	85.82
	1,419.97

Price of Silver.

August, 20th. Highest	101.750
August, 4th. Lowest	92.750
Average	96.168

THE GOLD MINES.

The Porcupine District.

After having been harassed by an inadequate supply of labor, with pleas for higher wages, as well as steadily mounting costs of material and supplies, the gold mining industry of Northern Ontario seems about to reap the benefit of a favorable change in conditions. News despatches which at this date carry the information that substantial reductions are being made in the cost of such articles as automobiles, cotton, leather, corn, etc., are pointed to as marking the commencement of a re-adjustment. These same despatches tell about large numbers of men being laid off, and in this direction lies the hope that an abundant supply of labor will be available at the mines before the coming winter passes.

A full labor supply in the Porcupine field would add greatly to the production of gold. Milling equipment lying idle, and ore blocked out and ready to mine leaves it only necessary to procure the desired number of men in order to add about fifty per cent to the current production.

Ore being drawn from stopes on the Dome Mines is running higher than the earlier estimates showed. Some of this ore had previously been estimated to contain only a little over \$4 to the ton, while actual recovery now shows a gold content of over \$6 to the ton. The mill continues to treat about 1,000 tons of ore daily.

Among the most interesting features in connection with the annual statement of the McIntyre-Porcupine mine may be noted an increase of over 72,000 tons in the amount of broken ore, as well as the increase of about \$1,000,000 in ore reserves and the tendency of the gold content to increase at depth. Perhaps the most important statement made by the general manager R. J. Ennis is that having to do with the discovery of the eastern continuation of No. 84 orebody of the Hollinger, in which Mr. Ennis says:

"Drill hole 180 put out S. 20 degrees W. at an angle of 15 degrees from the 1500-ft level intersected an ore body 530 feet from the main shaft at a depth of 1610 feet from surface. 35 feet of core assayed \$11.10. Hole 184 was then drill from the 1375-ft level. at an angle of 5 degrees, bearing S.20 degrees E. At 480 feet this

hole intersected the same ore body at a depth of 1385 feet from the surface — 26 feet of the core assayed \$14.10.

"Cross-cuts are being driven south from the 1375 and 1500-ft levels to open up this ore body and it is our opinion that the values and widths shown by the drill holes will be confirmed. From the very favorable location of the ore body, it is expected to develop a large tonnage of high-grade milling-ore."

There is some promise of a resumption of activity in the western part of the township of Deloro and the eastern part of Odgen. The leading property in that section of the Porcupine area is the Hayden-Porcupine Mines, where a mining plant was installed some years ago, and several hundred feet of underground work driven with promising results. Negotiations now involve property in this section and indicate the possibility of American capital becoming interested.

The Kirkland Lake Field.

Properties in the township of Lebel, lying to the east of the producing territory continue to stand up well under aggressive work. The number of discoveries made during recent months in this area exceeds any other gold-bearing district in the North during this period and it only remains to be seen how important these finds are. Very favorable reports are coming from the Wood-Kirkland property where gold occurs in a vein measuring about ten feet in width.

The annual meeting of the Orr Gold Mines has been called for Sept. 30th. Business to be brought before the meeting includes the question of proceeding with negotiations in connection with a proposed merger between the Kirkland Lake and the Teck-Hughes Gold Mines. As regards the status of the Orr, president Conrad E. Wettlaufer says: "Since my election on July 15th, 1920, money has been procured and the judgment against, and the debts of the Company have been paid, and an engineer, Mr. J. C. Houston, has been employed. He with his staff have de-watered the mine, have done considerable exploration work, and have extended the cross-cut and cut a vein supposed to be No 1. vein of the Lake Shore mine. This vein is about five feet wide and well mineralized and promises well for future development."

As regards the issue of 800,000 treasury shares of the Orr Gold Mines to Hamilton B. Wills, the Toronto broker, nothing is said in the notice of annual meeting. However, the minority interests of the Orr are taking the necessary legal steps and are endeavoring to prevent the issue.

The affairs of the Tough-Oakes are still uncertain. Since early last Spring, officials have been expecting matters to be adjusted in so as permit resumption of work, but unforeseen delays have occurred from time to time, and the date of opening now is generally regarded locally as a "guess" at best. In view of the extremely high cost of heating the scattered mine buildings of the Tough-Oakes and the probable difficulty to be encountered in gathering a force of men, one of these guesses is that work may not be undertaken in a general way until next Spring.

Surveyors are at work at Indian Chutes on the Montreal River, near Fort Matachewan, completing a survey of the water power. Provided conditions are favorable, it is reported work may be undertaken so as to have a plant installed by one year from now.

NORTHERN ONTARIO URGES DEVELOPMENT OF WATER POWER.

The approach of winter in Northern Ontario, the high price of coal, and the great difficulty to procure this necessity at any price has given rise again to serious discussion of devising some scheme that would make it possible to utilize the vast amount of potent heat and power going to waste in the many great waterfalls throughout these northern regions.

A serious obstacle at this time is the exceedingly high cost of material required in connection with installing power plants. The obstacle is a formidable one on account of the largest item to be charged against hydro-electric plants, once they are erected, being interest on the capital invested.

After discussing the problem with a great many experts, and after making inquiry regarding local opinion, it is obvious that any movement calculated to utilize this great natural resource would meet with general approval. And singularly enough, the Temiskaming and Northern Ontario Railway Commission is pointed to as the logical body to launch the project and to place Northern Ontario hydro development under the management of a thoroughly competent expert.

Mention of the T. & N. O. Ry. in this connection is based upon two reasons, one of which is the fact that the electrification of the 300 miles or so of this Government owned railway is considered reasonably certain within the next few years, and the other is the desirability of valuable co-operation between the railway which serves the district and the organization which will direct the hydro-electric developments.

The development of high-tension electric transmission has made hydro-electric energy the most efficient form of power yet devised. The statistics which show American railways are employing one-third of their rolling stock in hauling coal is pointed to as a lesson for Canadians, and offers fair warning in this country where the rigors of a northern climate are bound to cause a repetition of the American experience and where the wide stretches over which no coal deposits occur convey the threat of even more dire consequence.

Although no coal deposits occur in the province of Ontario, the estimated potential power running to waste in the rivers of the province is approximately 7,000,000 h.p., of which only 985,000 h.p. has so far been developed. These facts all promise to be brought into more or less prominence owing to the discussion now developing in Northern Ontario.

USES IN THE UNITED STATES FOR CANADIAN FELSPAR.

By KIRBY THOMAS, New York.

The resumption of activities in the American plants, engaged in the production of clay products in the form of pottery, crockery, sanitary enamel ware and surfaced tile for building, has led to increased demand for felspar, which is used as a flux in the glaze. This increased demand is being supplied in large part from Ontario, where a number of old mines have been reopened and new ones developed recently. The Canadian product, which is imported without duty, is in competition with the domestic supply, which now comes largely from the southern Appalachian region. The

chief consuming centers for the product are in the Ohio valley district, and therefore the imported felspar has about an even break as to freight rates with the domestic product. Many of the Canadian properties are American owned and operated. There is increased activity in the demand and development for felspar properties in the south, particularly in the Carolina region accessible to cheap railroad transport to northern points. A part of the supply for eastern plants comes from New York state and Maine. The quoted prices of crude felspar range from \$8 to \$18 per gross ton at points of production f.o.b., depending upon the grade and quality, particularly the potash content of the product. Most of the Canadian product is imported crude, but the domestic production is quite largely ground at the mines and brings a correspondingly higher price.

The attempts to utilize felspar as a source of potash which were made during the war when potash was at a high price, owing to the exclusion of the German supply, have quite generally been abandoned, having been a failure from a commercial standpoint. This has left the chief market for felspar as before the War in the field of accessories to the varied clay operations, and as flux. Some felspar is used in glass making.

There are no imports of this material regularly from other countries than Canada.

A SINKING RECORD.

Thirty-five days for the complete sinking and timbering a 263 ft. shaft, is a recent achievement of the Johnson City Coal Co., at its No. 2 mine at Johnson City, Illinois. The shaft is 10 ft. 6 in. by 15 ft. 6 in. inside and is divided into two compartments. Of these the manway is 4 ft. wide and the air shaft proper is 11 ft. wide. A 6 in. wall is placed between these compartments. A concrete lining extends down the shaft for a distance of 22 ft. from the surface and rests upon solid rock. This lining is 12 in. thick and is reinforced vertically with 1-2 in. rods on 12 in. centres and horizontally on 8 in. centres. The foot of the shaft also is concrete lined for a distance of 30 ft. upward from the top of the coal bed. Footing is made upon the limestone underlying the coal. The lining here also is 12 in. thick and is reinforced in exactly the same way as the lining at the top. The shaft timbers are 6 in. by 6 in. long leaf yellow pine treated with carbolineum. Bearing sets are 12 in. by 12 in. yellow pine resting on a 5 in. ledge of rock throughout their entire length and set into the rock for 2 ft. at their ends. The partition between the manway and air shaft is of 4 in. yellow pine extending between 4 in. by 6 in. wall plates. The shaft walls between top and bottom concrete linings are covered with expanded metal lath upon which has been placed 2 in. of gunite.

On August 16, 1919, shaft sinking was commenced and three shifts per day were kept at work continuously thereafter. Work was also begun from underground in driving the shaft upward, a few men being kept steadily at this work. This upward driving finally attained a height of 60 ft. On September 17, the two portions of the shaft (upper and lower) were joined by sump shots in the upper section. On September 20 the two places were completely connected and timbered. The total distance sunk was 263 ft., and the time consumed was 35 days.

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TORONTO MINING STOCKS.

Closing Quotations on Standard Stock Exchange,
September 28th.

Silver.	Asked	Bid
Adanac	3 $\frac{1}{4}$	3
Bailey	4 $\frac{3}{4}$	4 $\frac{1}{2}$
Beaver	43	42
Chambers-Ferland	7	5
Cobalt	46	44
Coniagas	—	2.50
Crown Reserve	28	—
Foster	3 $\frac{1}{8}$	2 $\frac{1}{2}$
Gifford	2 $\frac{1}{8}$	2
Hargraves	2 $\frac{7}{8}$	2 $\frac{1}{2}$
Kerr Lake	3.40	3.25
La Rose	—	32 $\frac{1}{2}$
Lorrain	6	—
Mc. Kinley-Darragh	58	—
Mining Corporation	1.65	1.60
Nipissing	10.75	10.60
Ophir	3 $\frac{1}{4}$	2 $\frac{3}{4}$
Peterson Lake	15 $\frac{3}{4}$	15 $\frac{1}{4}$
Right of Way	3 $\frac{1}{4}$	1 $\frac{3}{4}$
Silver Leaf	3	2
Timiskaming	36 $\frac{1}{2}$	36
Trethewey	29	28
Gold.		
Apex	2 $\frac{3}{4}$	2
Atlas	15	11
Boston Creek	—	15
Dome Extension	41	39
Dome Lake	6	5
Dome Mine	12.25	11.75
Gold Reef	4 $\frac{1}{8}$	4
Hollinger	5.75	5.70
Hunton	12	11
Keora	19 $\frac{1}{2}$	18
Kirkland Lake	50	49 $\frac{1}{2}$
Lake Shore	1.12	1.09
Mc. Intyre	2.07	2.06
Moneta	12	11 $\frac{1}{2}$
Newray	7 $\frac{1}{2}$	7
Porcupine Crown	30	27
Porcupine V.N.T.	27	26 $\frac{1}{2}$
Preston	3 $\frac{1}{2}$	3
Schumacher	22	21
Teck-Hughes	8 $\frac{1}{4}$	8
Thompson-Krist	9 $\frac{1}{2}$	8 $\frac{3}{4}$
W. Dome	7 $\frac{1}{2}$	7
Westree	5 $\frac{1}{2}$	5 $\frac{1}{8}$
Wasapika	15	9
Miscellaneous:		
Rockwood	4 $\frac{3}{4}$	4 $\frac{1}{4}$
Vac. Gas	26	25

METAL QUOTATIONS.

Fair prices for Ingot Metals in Montreal Sept. 30th
1920. (In less than carload lots).

	Cents per lb.
Copper, electro	23
Copper casting	22 $\frac{1}{2}$
Tin	52
Lead	8 $\frac{3}{4}$
Zinc	9 $\frac{3}{4}$
Aluminum	35
Antimony	8 $\frac{3}{4}$

ASBESTOS PRICES.

Prices Current—August 1920. (From "Asbestos").

Average market prices paid by consumers for average quantity, quality and freight haul from producer, were about as follows:

Asbestos Air Cell Covering, 4 Ply	35% to 40% off
" Air Cell Paper in rolls	\$10.00 to \$12.00
" Air Cell Paper	
" Cement	\$1.75 to \$3.00 cwt.
" Cloths, 10s Commercial	\$1.50 to \$2.00 lb.
" Listings and Tapes	\$1.75 to \$1.90 lb.
" Millboard	\$12.00 to \$18.00 cwt.
" Packing, Steam, High Pressure	\$1.25 to \$2.00 lb.
" Packing Sheet	\$1.00 to \$1.50 lb.
" Wick and Rope65 to \$1.00 lb.
" Paper, Commercial	\$12.00 to \$18.00 cwt.
" Paper and Millboard	
Special	\$17.00 to \$35.00 cwt.
" Yarns, 10s Commercial	\$1.35 to \$1.90 lb.
" Yarn and Cloth, Special	\$2.00 to \$6.00 lb.

The foregoing authority also notes there is offered for sale 15 tons of Jacobs No. 1 crude, pre-war grade, at a price of \$2,300 per ton f.o.b. point of shipment, terms 2-10-30 or \$2,200 per ton. Material is in the United States.

Production at Canadian mines is below demand, and prices are likely to advance rather than to decline for crude asbestos. Asbestos handlers lay much stress on amount of low-grade cloths needed for renewal of brake linings on freight cars.

TORONTO COAL QUOTATIONS.

Toronto, Sept. 30.—Coal is not moving any more freely and the shortage continues. The market is quiet and last week's shortage of cars affected shipments to this point. Hard coal is quoted at from \$8.00 to \$16.00 gross tons at the mines. American funds: mine run \$14.00 to \$15.00 f.o.b. Toronto and smokeless coal \$14.50 to \$16.00.

GRANBY CONSOLIDATED.

Making About \$60,000 Profit a Month.

It is understood that Granby Consolidated Mining, Smelting and Power Co., has been making a net profit of \$60,000 a month after all charges, bond interest and extraordinary items.

Copper costs at Anyox have been running close to 10 $\frac{1}{2}$ cents a pound during the past few months. The increased freight rate, effective since August 26, will be an added burden to the company, as its smelter product traverses the full width of the continent and must pay a higher toll both in Canada and the United States.

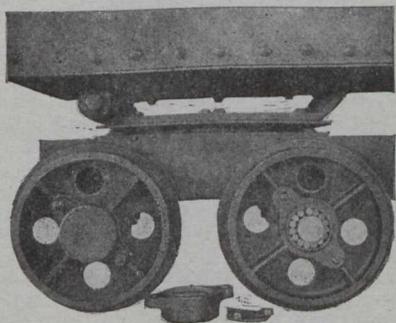
Until the metal market improves, the copper producers must pay the higher freight charges, but eventually the producers anticipate a sufficient advance in copper to offset fully the new levy.

Few, if any, copper companies have a longer haul than Granby from smelter to refinery, and the increased freight rates are heavier in proportion to its production than any other properties on the American continent.—"Boston News Bureau".

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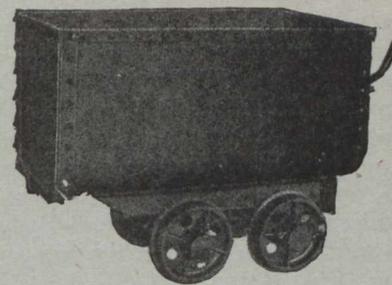
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"ANCHADURA". A MODERN SECONDARY SOLUTION CONCENTRATE.

An interesting mineral phenomenon is mentioned in the recent report by Mr. Frank B. Powell on the property of the Colombian Mining and Exploration Company. According to Mr. Powell, the mine has been worked for over 100 years nearly continuously, and he goes on to describe the much-talked-of "anchadura". "This is a product", he writes, "which deposits in, and fills in, most of the old stopes throughout the mine. In some instances the whole stope for 20 ft. wide is filled. Its occurrence in such great quantities as are apparent in this mine is hard to account for, but the fact remains that, in practically every old stope that has been worked out and left without a circulation of air, this anchadura is deposited.

"In every instance where sampled it showed values ranging from 8s to 48s, the lower values being in the newly-deposited product. About 30 p.e. of the values are in free gold, the balance in pyrites. The free gold is all crystalline and of secondary occurrence. There are approximately 300,000 tons of this material in the old stopes of the mine, which is worth about 24s per ton." The only really remarkable thing about this "anchadura" is the quantity. It is very evidently a secondary formation, brought about by the pressure of the surrounding rocks squeezing out siliceous matter in conjunction with water.

There are two ways in which mineralised matter is generally deposited, either by its being held in solu-

tion in water descending or in liquid ascending. If the two bodies meet the contact of cold and hot temperatures usually brings about a sedimentation of the mineral matter which may be held in solution in either of the waters, and naturally such sediment would be carried forward in the direction in which the water can escape. The fact that the newer deposits of anchadura are less valuable than the older deposits tends to show that the values are deposited by water, which evaporates or escapes, and, of course, the longer the siliceous or disintegrated matter has been subjected to the influence of such water, which apparently carries gold in solution, the richer it would become.

The existence of what is commonly called secondary formations is not uncommon in any mine, where the plane of the rocks favours the squeezing out either by pressure or water action of disintegrated material. In the Rand the formation of such secondary formations is, I am informed, not by any means an uncommon occurrence, although it is rare that such formation carries payable values.

Here we have a very ancient mine, where the process has been going on for the greater part of a century, and where there is evidently a water saturation, carrying gold in solution, which finds an outlet in the old workings, carrying with it sand, pulverised rock, etc., in which it leaves the gold as it evaporates or is gradually drained away. As I have mentioned, the quantity is remarkable; that is all.—W. I. L. In "Financier and Bullionist."

PIONEERS OF THE YUKON.**An Address by the Right Rev. Bishop Stringer.**

This year's celebration of the twenty-fourth anniversary of the discovery of gold in the Klondyke, held at Dawson City under the auspices of the Yukon Order of Pioneers, was especially notable because there arrived at that historic centre on the same day the aviators engaged in a flight from New York to Nome, Alaska, and return and by reason of an exceptionally able address by Right Reverend Bishop I. O. Stringer, who is well-known and highly respected among Yukon pioneers.

Bishop Stringer's speech so thoroughly sketches the history of the north country and so interprets the spirit of the present residents of that territory that it is well worth publication in extenso.

He said :

WORK OF PIONEERS.

"For many years I had hoped to be present at a Discovery Day celebration, but this is the first time that my duties allowed me to be in Dawson on the seventeenth of August. It seems, therefore, strange that I should be asked to give an address of welcome on this occasion, and I know many of you who are present could more appropriately perform the task. However, it may be said truthfully that I represent a succession of pioneers older than any other continuous institution in the country. And most gladly do I respond to the kind invitation of the president and other officers of the Y. O. O. P., and only hope that the few poor remarks I shall make may be taken to show, even in an inadequate manner, my intense interest in all that concerns the people of this great northern land, and especially in the pioneers who blazed the trails and whose memories we shall always revere. The majority of those present are as much at home here as I am and need no words of welcome. To those who may be strangers or visitors I extend to them, on behalf of the Y. O. O. P., the heartiest kind of welcome that human beings can give. We wish all to feel at home; we wish all to learn of our short history and to identify themselves with the town and the country and to stay as long as possible with us. And we have a great history also.

HISTORIC POINTS.

"I have recently visited Fort Yukon and the Porcupine River, down which J. Bell made his first journey, coming from the Mackenzie River side in 1846. The next year Murray established a post at Fort Yukon. In 1843 Campbell had come down the Pelly to the river which he named Lewes and in 1848 he established a post which he named Fort Selkirk. Thus within a year of each other these two trading posts were established on the same river 550 miles apart by the same Hudson's Bay Company, and no one then knew that they were on the same water course.

"Only in 1850, when Campbell descended the river from Fort Selkirk to Fort Yukon, did anyone know that the river was one and the same. This explains why the river above Selkirk was named Lewes, after the chief factor of the Hudson's Bay Company, while the river from Fort Selkirk to St. Michael retained the Indian name, "Yukon" which explained the old name "Kwikipak" (Eskimo for big river), by which the river

was known by the old Russian traders. Campbell, however, spoke of the Pelly as continuing to Fort Yukon. In one respect it may be said that the history of this part of the country began in 1850 so far as the white man is concerned. In that year Campbell came down the river, being the first white man, so far as we know, who passed the mouth of the Klondyke or Thohndik.

EARLY GOLD DISCOVERY.

"The sacking and looting of Fort Selkirk by the Chilkat Indians in 1852 broke the connection for the time being between Fort Selkirk and Fort Yukon. For the following twenty or thirty years any information regarding the interior was obtained chiefly through the post at Fort Yukon. In the early sixties gold was known to exist in the Yukon valley.

"The other day I met a miner who was taking out gold on the tributary of Birch Creek where Archdeacon McDonald found some nuggets in 1863, just fifty-seven years ago.

"In the late sixties and seventies a few men began to prospect in various parts of the country. These were men who for the most part were traders and trappers first and prospectors afterwards. Then in the 'eighties pioneers came into the Yukon valley by various routes, chiefly over the Chilcoot and White Passes and by way of the Hootalinqua. The Fortymile and Circle Camps were established.

And then we all know the story of 1896, when, on the seventeenth of August, just twenty-four years ago today, the discovery of gold on the Bonanza opened up a new era in the history of this country. Within a year thousands of gold seekers were on their way to this hitherto unknown and unnoticed region. Many difficulties were encountered and much suffering endured in that great rush to the North. In spite of all obstacles many found their way to this land which was then considered very remote, and many of the early pioneers are with us yet. Some have come and gone, and some have made the last march along the trail in this life and are laid to their long rest in this land. Others have remained on and are living witnesses of the attractions and allurements of this northern country.

TEST OF HUMAN CAPACITY.

"All honor to the pioneer. We feel a thrill of pride at the thought of the perseverance and endurance and optimism of the trail blazers of bygone days. The experience of the war proves that the present generation shows no deterioration. That men and women are capable of doing great things now as in past ages. It needs only the occasion and demand to bring out the greatest attributes of mankind. So also the qualities that go to make up the pioneer are not extinct. We have men and women in his country who are as capable and resourceful as the pioneers of older days. The occasion only is needed to prove what they can do. The true pioneer will be prepared to take his place when there is some special call on his energies and resources. But also he has a duty to perform in everyday life.

"This is the second Discovery Day celebration since the conclusion of the war. As time goes on we are apt to lose sight of its lessons. This time of peace is a day of opportunity. The future is before us. We possess a land full of resources and boundless possibilities. Who would have thought in the days when the Harpers and McQuestens and Ladues and Mayos, and, later, the O'Briens, and many others whom we could name, wandered over this virgin land, seeking for gold, that the time would come as it did when within eight years, 1898-1905, a hundred millions in gold would have been taken from the tributaries of the Klondyke, mostly by pri-

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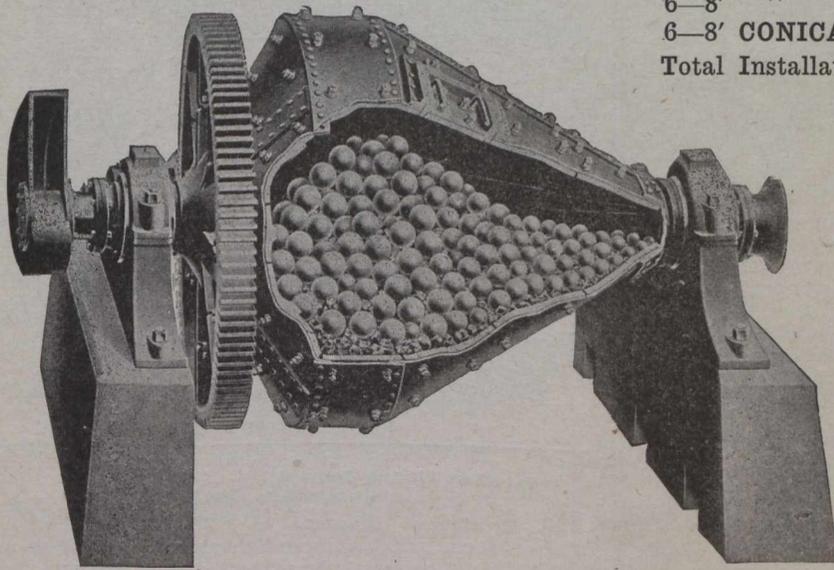


And Nevada Con. Takes Six More

Another "Crushing Victory" for Hardinge Mills is recorded by the fourth repeat order just received from the Nevada Consolidated Copper Company.

2-8'	CONICAL BALL MILLS	December	1915
2-8'	" " " "	July	1916
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6-8'	" " " "	June	1917
6-8'	CONICAL BALL MILLS	JUNE	1920

Total Installation — 18 Hardinge Conical Mills.



The first repeat order was the result of a direct competitive test.

The last repeat order (just placed) is the result of another competitive test under different conditions.

It is the proven superiority of Hardinge Conical Mills—as demonstrated at the Nevada Consolidated and scores of other plants—that has made them the standard equipment for preliminary and fine grinding in plants all over the world.

Our "Grinding Data" leaflets give specific figures and information that will enable you to judge just what Hardinge Mills can do for you. We will be glad to send them.

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mitive methods. When we shall have another Klondike no one can tell, but the possibilities are enormous.

MORE THAN GOLD.

With gold and other metals scattered all over this country it is altogether all over this country probable and reasonable to expect that other great strikes should be made. Just where the next great camp may be we do not know. We hope it will be Mayo, but, wherever it is, I believe it will be only the forerunner of other discoveries in days to come. Then we have the other resources, the fur and the products of the forests and streams and the land. In giving lectures to the soldiers in Belgium and France on Canadian citizenship, whenever I noticed the instant and earnest attention by telling of the resources of our great country, and especially by dwelling on the possibilities of the North. We take it as a matter of course that this district can produce potatoes and other vegetables successfully and that certain grains can be ripened, but many people outside are still astonished to hear this and some will scarcely credit it. Yet I believe we are only at the beginning of things agricultural.

"I took forward also to the time when the great barren lands of the North will teem with reindeer and other animals suited to the conditions of the country and climate. Whatever success this country may encounter in the future it will be largely due to the pioneers who led the way and who will still carry on in spite of all obstacles. Some, also, have passed away in the midst of the struggle, but their example is an inspiration to others. May every pioneer who is with us today have the desire of his heart fulfilled and may peace and prosperity be his to the end.

A PROPHECY.

"How appropriate it is that at this celebration of pioneers we should now be about to welcome the pioneers of air who alight in our midst for the first time. This feat is prophetic of the time when we shall no longer be isolated from what we call the outside world, when the difficulties of navigation in air will be overcome and when the words "outside" and "inside" will have lost their meaning and when we shall be connected with the world generally by steel on land and by wings through the air. It is an epochal day for Yukon and for the North generally. All honor to the birdmen. May success crown their efforts. We look backward with pride and satisfaction in contemplation of the accomplishments of the pioneer and we look forward with hope and courage and then we endeavor to perform the task of today with the desire of doing our duty to ourselves, our fellowmen, our country and our Maker.

"I referred just now to the lessons of the war which should not be forgotten. We think of the terrible sacrifice during the war—the suffering, the misery incalculable continuing to the present, and we ask, "Will this be in vain?" We think of friends whose bodies are lying in Flanders and France. We know there are many and difficult problems to be solved in the world. We need the spirit of true pioneers if we would take out part in everything relating to the upbuilding of our community and country and in the betterment of the affairs of the world. And as we march along the trail of life let us keep the final camp in view, taking our stand for all that is right, and thus help to make our home, our country and the world the better for our presence and our influence—pioneers—leaders in all that is good and noble in life."

The Royal Commission on Coal Mining Operations in Nova Scotia and New Brunswick states: "The Commission has noted that the output per man per day in the United States is greatly in excess of that produced in the Nova Scotia coalfields, and have also noted that the cost of production per ton is much less in the United States than Nova Scotia. Under these circumstances it takes occasion to remark that in a competitive market the U. S. coal operators have an advantage over the N. S. operators."

It would have been interesting had the Commission noted the reasons for this difference in productive ability. It is much less a matter of individual manual productivity, than of physical conditions and statutory mine supervision, nor would an exhaustive analysis be unfavorable either to the Nova Scotian miner or the Nova Scotian mining engineer.

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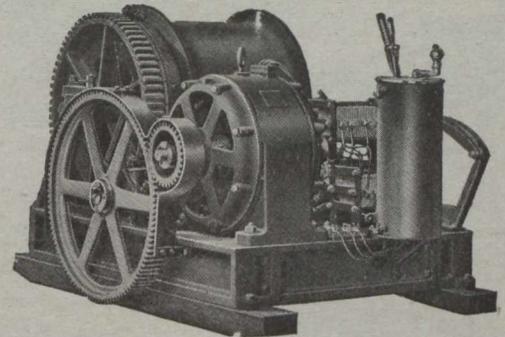
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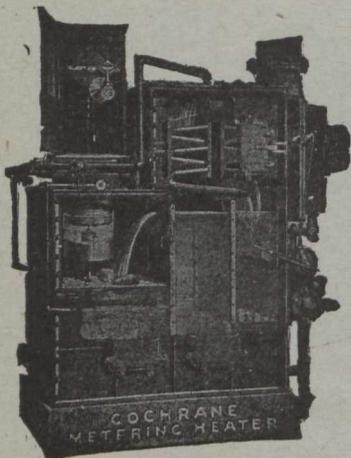
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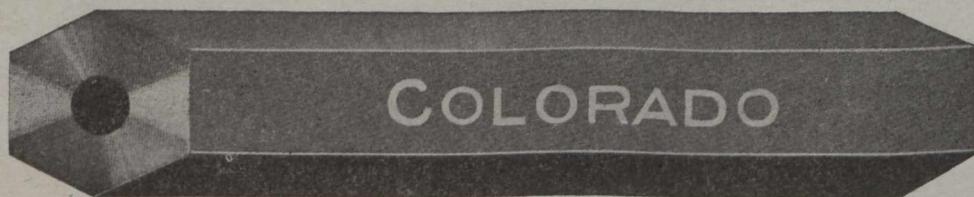


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Aggregate Value of \$670,649,894

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- Coal and Coke Handling Machinery**
Canadian Mead-Morrison Co., Limited.
Canadian Link-Belt Co., Ltd.
- Coal Pockets:**
Canadian Mead-Morrison Co., Limited.
- Coal Pick Machines:**
Sullivan Machinery Co.
- Coal Screening Plants:**
Canadian Link-Belt Co., Ltd.
Canadian Mead-Morrison Co., Limited.
- Cobalt Oxide:**
Coniagas Reduction Co.
Everitt & Co.
- Compressors—Air:**
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.
MacGovern & Co., Inc.
R. T. Gilman & Co.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
The Mine & Smelter Supply Co.
- Concrete Mixers:**
Canadian Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.
Gould, Shapley & Muir Co., Ltd.
MacGovern & Co., Inc.
Mussens, Limited
R. T. Gilman & Co.
- Condensers:**
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Northern Canada Supply Co.
MacGovern & Co., Inc.
- Concentrating Tables:**
The Mine & Smelter Supply Co.
Deister Concentrator Co.
The Wabi Iron Works
- Converters:**
Northern Canada Supply Co.
MacGovern & Co., Inc.
- Conveyors—McCaslin Gravity Bucket:**
Canadian Mead-Morrison Co., Limited.
- Contractors' Supplies:**
Canadian Fairbanks-Morse Co., Ltd.
- Consulters and Engineers:**
Hersey Milton Co., Ltd.
- Conveyors:**
Canadian Link-Belt Co., Ltd.
The Mine & Smelter Supply Co.
Jones & Glassco (Regd.)
- Conveyor Belts:**
Gutta Percha & Rubber, Ltd.
- Conveyor Flights:**
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co., Ltd.
- Conveyor—Trough—Belt:**
Canadian Fairbanks-Morse Co., Ltd.
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.
Mussens, Limited
Jones & Glassco (Roller, Belt and Chain)
Hendrick Mfg. Co.
The Wabi Iron Works
- Conical Mills:**
Hardinge Conical Mill Co.
- Copper:**
The Canada Metal Co., Ltd.
Consolidated Mining & Smelting Co.
- Couplings:**
Hans Renold of Canada, Limited, Montreal, Que.
- Cranes:**
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.
Canadian Link-Belt Company
R. T. Gilman & Co.
Smart-Turner Machine Co.
- Crane Ropes:**
Allan Whyte & Co.
Canada Wire & Cable Co.
Greening, B., Wire Co., Ltd.
- Crucibles:**
Canadian Fairbanks-Morse Co., Ltd.
The Mine & Smelter Supply Co.
- Crusher Balls:**
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries, Limited, Hull, Que.
Osborn, Sam'l (Canada) Limited.
Swedish Steel & Importing Co., Ltd.
- Crushers:**
Canadian Fairbanks-Morse Co., Ltd.
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
Hardinge Conical Mill Co.
Osborn, Sam'l (Canada) Limited.
The Electric Steel & Metals Co., Ltd.
R. T. Gilman & Co.
Lymans, Ltd.
Mussens, Limited

THE CONIAGAS REDUCTION

COMPANY, LIMITED

St. Catharines - - Ontario

Smelters and Refiners of Cobalt Ores

Manufacturers of

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Bar Silver—Electrically Refined
Arsenic—White and Metallic
Cobalt Oxide and Metal
Nickel, Oxide and Metal

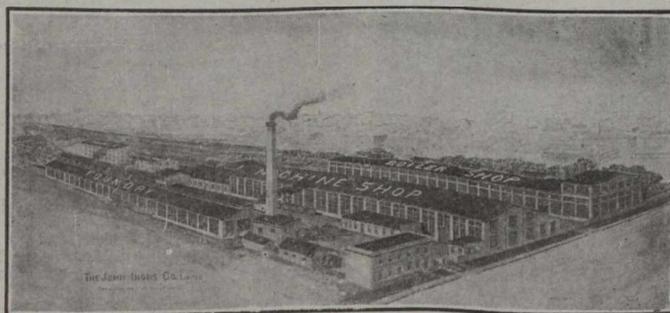
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Canadian Miners' Buying Directory.—(Continued)

- The Mine & Smelter Supply Co.**
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works
- Cut Gears:**
Hans Renold of Canada, Limited, Montreal, Que.
- Cyanide:**
American Cyanamid Company.
- Cyanide Plant Equipment:**
The Dorr Co.
The Mine & Smelter Supply Co.
- D. C. Units:**
MacGovern Co.
- Derricks:**
Smart-Turner Machine Co.
Canadian Mead-Morrison Co., Limited.
Marsh Engineering Works
R. T. Gilman & Co.
Canadian Fairbanks-Morse Co., Ltd.
Mussens, Limited
- Diamond Drill Contractors:**
Diamond Drill Contracting Co.
E. J. Longyear Company
Smith & Travers
Sullivan Machinery Co.
- Diamond Tools:**
Diamond Drill Carbon Co.
- Diamond Importers:**
Diamond Drill Carbon Co.
- Digesters:**
Canadian Chicago Bridge and Iron Works
- Dies:**
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries, Ltd.
- Dredger Pins:**
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
The Electric Steel & Metals Co.
Hadfields, Limited
- Dredging Machinery:**
Canadian Steel Foundries, Ltd.
Canadian Mead-Morrison Co., Limited.
Hadfields, Limited
Hull Iron & Steel Foundries, Ltd.
R. T. Gilman & Co.
- Dredging Ropes:**
Allan, Whyte & Co.
Greening, B., Wire Co., Ltd.
R. T. Gilman & Co.
- Drills, Air and Hammer:**
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Northern Canada Supply Co.
Osborn, Sam'l (Canada) Limited.
The Mine & Smelter Supply Co.
Mussens, Limited
- Drills—Core:**
Canadian Ingersoll-Rand Co., Ltd.
E. J. Longyear Company
Standard Diamond Drill Co.
Sullivan Machinery Co.
- Drills—Diamond:**
Sullivan Machinery Co.
Northern Canada Supply Co.
E. J. Longyear Company
- Drill Steel—Mining:**
H. A. Drury Co., Ltd.
Hadfields, Limited
International High Speed Steel Co., Rockawa
Osborn, Sam'l (Canada) Limited.
Mussens, Limited
Swedish Steel & Importing Co., Ltd.
- Drill Steel Sharpeners:**
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Northern Canada Supply Co.
Sullivan Machinery Co.
Osborn, Sam'l (Canada) Limited.
The Wabi Iron Works
- Drills—Electric:**
Canadian Fairbanks-Morse Co., Ltd.
Sullivan Machinery Co.
Northern Electric Co., Ltd.
- Drills—High Speed and Carbon:**
Canadian Fairbanks-Morse Co., Ltd.
Osborn, Sam'l (Canada) Limited.
H. A. Drury Co., Ltd.
Hadfields, Limited
- Dynamite:**
Canadian Explosives
Giant Powder Company of Canada, Ltd.
Northern Canada Supply Co.
- Dynamos:**
Canadian Fairbanks-Morse Co., Ltd.
MacGovern & Company
- Ejectors:**
Canadian Fairbanks-Morse Co. Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.
- Elevators:**
Canadian Mead-Morrison Co., Limited.
Canadian Link-Belt Co., Ltd.
Sullivan Machinery Co.
Northern Canada Supply Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
Jones & Glassco (Regd.)
Mussens, Limited
The Wabi Iron Works
- Engineering Instruments:**
C. L. Berger & Sons
- Engines—Automatic:**
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.
Fraser & Chalmers of Canada, Ltd.
- Engines—Gas and Gasoline:**
Canadian Fairbanks-Morse Co., Ltd.
Alex. Fleck
Fraser & Chalmers of Canada, Ltd.
Osborn, Sam'l (Canada) Limited.
Sullivan Machinery Co.
Gould, Shapley & Muir Co., Ltd.
MacGovern & Co., Inc.
The Mine & Smelter Supply Co.
- Engines—Haulage:**
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Canadian Mead-Morrison Co., Limited.
Marsh Engineering Works
Fraser & Chalmers of Canada, Ltd.
- Engines—Marine:**
Canadian Fairbanks-Morse Co., Ltd.
MacGovern & Co., Inc.
Swedish Steel & Importing Co., Ltd.
- Engines—Steam:**
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.
R. T. Gilman & Co.
MacGovern & Co., Inc.
Fraser & Chalmers of Canada, Ltd.
- Engines—Stationary:**
Swedish Steel & Importing Co., Ltd.
- Engineers:**
General Engineering Co., New York
The Dorr Co.
- Ferro-Alloys (all Classes):**
Everitt & Co.
- Feed Water Heaters:**
MacGovern & Co.
- Fire Fighting Supplies:**
Gutta Percha & Rubber, Ltd.
- Flashlights—Electric:**
Spielman Agencies, Regd.
- Flood Lamps:**
Northern Electric Co., Ltd.
- Flourispar:**
The Consolidated Mining & Smelting Co.
Everitt & Co.
- Forges:**
Canadian Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.
- Forging:**
Canadian Mead-Morrison Co., Limited.
Canadian Foundries and Forgings, Ltd.
Hull Iron & Steel Foundries, Ltd.
Smart-Turner Machine Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
- Frogs:**
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
John J. Gartshore
- Frequency Changers:**
MacGovern & Co., Inc.
- Furnaces—Assay:**
Canadian Fairbanks-Morse Co., Ltd.
Lymans, Limited
Mine & Smelter Supply Co.
- Fuse:**
Canadian Explosives
Giant Powder Company of Canada, Ltd.
Northern Canada Supply Co.
- Gaskets:**
Gutta Percha & Rubber, Ltd.
- Gears:**
Hans Renold of Canada, Limited, Montreal, Que.
Jones & Glassco (Regd.)
- Gears (Cast):**
Hull Iron & Steel Foundries, Ltd.
Canadian Link-Belt Co., Ltd.
- Gears, Machine Cut:**
Canadian Fairbanks-Morse Co., Ltd.
Canadian Steel Foundries, Ltd.
The Electric Steel & Metals Co.
The Hamilton Gear & Machine Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works
- Granulators:**
Hardinge Conical Mill Co.
- Grinding Wheels:**
Canadian Fairbanks-Morse Co., Ltd.
- Gold Refiners**
Goldsmith Bros

Canadian Miners' Buying Directory.—(Continued)

Gold Trays:

Canada Chicago Bridge & Iron Works

Hose (Air Drill):Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.**Hose (Fire):**Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.**Hose (Packings)**Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.**Hose (Suction):**Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.**Hose (Steam):**Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.**Hose (Water):**Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.**Hammer Rock Drills:**Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Osborn, Sam'l (Canada) Limited.
Mussens, Limited
The Mine & Smelter Supply Co.**Hangers and Cable:**

Standard Underground Cable Co. of Canada, Lt

High Speed Steel:Canadian Fairbanks-Morse Co. Ltd.
H. A. Drury Co., Ltd.
Osborn, Sam'l (Canada) Limited.
Hadfields, Limited
International High Speed Steel Co., Rockaway.**High Speed Steel Twist Drills:**Canadian Fairbanks-Morse Co., Ltd.
H. A. Drury Co., Ltd.
Northern Canada Supply Co.
Osborn, Sam'l (Canada) Limited.**Hoists—Air, Electric and Steam:**Canadian Ingersoll-Rand Co., Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Jones & Glassco
Canadian Mead-Morrison Co., Limited.
Marsh Engineering Works
Northern Canada Supply Co.
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works
R. T. Gilman & Co.
Mussens, Limited
Canadian Link-Belt Co., Ltd.**Hoisting Engines:**Canadian Fairbanks-Morse Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
The Electric Steel & Metals Co.
Mussens, Limited
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Mead-Morrison Co., Limited
Marsh Engineering Works
Fraser & Chalmers of Canada, Ltd.
The Mine & Smelter Supply Co.**Hoisting Towers:**

Canadian Mead-Morrison Co., Limited.

Hose:Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha & Rubber, Ltd.
Northern Canada Supply Co**Hose (Steam, Air, Water):**

Gutta Percha & Rubber, Ltd.

Hydraulic Machinery:Canadian Fairbanks-Morse Co., Ltd.
Hadfields, Limited
MacGovern & Co., Inc.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works**Industrial Chemists:**

Hersey, M. & Co., Ltd.

Ingot Copper:Canada Metal Co., Ltd.
Hoyt Metal Co.**Insulating Compounds:**

Standard Underground Cable Co. of Canada, Ltd.

Inspection and Testing:

Dominion Engineering & Inspection Co.

Inspectors:

Hersey, M. & Co., Ltd.

Jacks:Canadian Fairbanks-Morse Co., Ltd.
Can. Brakeshoe Co., Ltd.
Northern Canada Supply Co.
R. T. Gilman & Co.
Mussens, Limited**Jack Screws:**

Canadian Foundries and Forgings, Ltd

Laboratory Machinery:

Mine & Smelter Supply Co.

Lamps—Acetylene:

Dewar Manufacturing Co., Inc.

Lamps—Carbide:

Dewar Manufacturing Co., Inc.

Lamps—Miners:Canada Carbide Company, Limited
Canadian Fairbanks-Morse Co., Ltd.
Dewar Manufacturing Co., Inc.
Northern Electric Co., Ltd.
Mussens, Limited**Lamps:**

Dewar Manufacturing Co., Inc.

Lanterns—Electric:

Spielman Agencies, Regd.

Lead (Pig):The Canada Metal Co., Ltd.
Consolidated Mining & Smelting Co.
Hoyt Metal Company.**Levels:**

C. L. Berger & Sons

Locomotives (Steam, Compressed Air and Storage SteeCanadian Fairbanks-Morse Co., Ltd.
H. K. Porter Company
R. T. Gilman & Co.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited**Link Belt**Canadian Fairbanks-Morse Co. Ltd.
Canadian Link-Belt Co., Ltd.
Northern Canada Supply Co.
Jones & Glassco**Machinists:**

Burnett & Crampton

Machinery—Repair Shop:

Canadian Fairbanks-Morse Co., Ltd.

Machine Shop Supplies:

Canadian Fairbanks-Morse Co., Ltd.

Magnesium Metal:Everitt & Co.
Hull Iron & Steel Foundries, Ltd.**Manganese Steel:**Canadian Steel Foundries, Ltd.
The Electric Steel & Metals Co.
Hadfields, Limited
Osborn, Sam'l (Canada) Limited.
Hull Iron & Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works**Metal Marking Machinery:**

Canadian Fairbanks-Morse Co., Ltd.

Metal Merchants:Henry Bath & Son
Geo. G. Blackwell, Sons & Co.
Coniagas Reduction Co.
Consolidated Mining & Smelting Co. of Canada
Canada Metal Co.
C. L. Constant Co.
Everitt & Co.
Hoyt Metal Company.**Metallurgical Engineers:**General Engineering Co., New York
The Durr Co.**Metallurgical Machinery:**General Engineering Co., New York
The Durr Co.
The Mine & Smelter Supply Co.**Metal Work, Heavy Plates:**

Canada Chicago Bridge & Iron Works

Mica:Everitt & Co.
Diamond Drill Carbon Co.**Mining Engineers:**

Hersey, M. Co., Ltd.

Mining Drill Steel:H. A. Drury Co., Ltd.
Osborn, Sam'l (Canada) Limited.

International High Speed Steel Co., Rockaway, N

Mining Requisites:Canadian Steel Foundries, Ltd.
Dominion Wire Rope Co., Ltd.
Hadfields, Limited
Osborn, Sam'l (Canada) Limited.
Hull Iron & Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works**Mining Ropes:**

Dominion Wire Rope Co., Ltd.

Mine Surveying Instruments:

C. L. Berger & Sons

Molybdenite:

Everitt & Co.

Monel Metal (Wire, Rod, Sheet and Foundry Metal):

International Nickel Co.

Motors:Canadian Fairbanks-Morse Co., Ltd.
R. T. Gilman & Co.
MacGovern & Co.
The Mine & Smelter Supply Co.
The Wabi Iron Works

Canadian Miners' Buying Directory.—(Continued)

- Motor Generator Sets—A.C. and D.C.**
MacGovern & Co.
- Nails:**
Canada Metal Co.
- Nickel:**
International Nickel Co.
Coniagas Reduction Co.
The Mond Nickel Co., Ltd.
- Nickel Anodes:**
The Mond Nickel Co., Ltd.
- Nickel Salts:**
The Mond Nickel Co., Ltd.
- Nickel Sheets:**
The International Nickel Co. of Canada
The Mond Nickel Co., Ltd.
- Nickel Wire:**
The Mond Nickel Co., Ltd.
The International Nickel Co. of Canada
- Oil Analysts:**
Constant, C. L. Co.
- Ore Handling Equipment:**
Canadian Mead-Morrison Co., Limited.
Canadian Link-Belt Co., Ltd.
- Ore Sacks:**
Northern Canada Supply Co.
- Ore Testing Works:**
Ledoux & Co.
Can. Laboratories
Milton Hersey Co.
Campbell & Deyell
General Engineering Co., New York
Hoyt Metal Co.
- Ores and Metals—Buyers and Sellers of:**
C. L. Constant Co.
Geo. G. Blackwell
Consolidated Mining and Smelting Co. of Canada
Oxford Copper Co.
Canada Metal Co.
Hoyt Metal Co.
Everitt & Co.
Pennsylvania Smelting Co.
- Packing:**
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha & Rubber, Ltd.
- Paints—Special:**
Spielman Agencies, Regd.
- Perforated Metals:**
Northern Canada Supply Co.
Hendrick Mfg. Co.
Canada Wire and Iron Goods Company.
Greening, B., Wire Co.
- Permissible Explosives:**
Giant Powder Company of Canada, Ltd.
- Pig Tin:**
Canada Metal Co., Ltd.
Hoyt Metal Co.
- Pig Lead:**
Canada Metal Co., Ltd.
Hoyt Metal Co.
Pennsylvania Manufacturing Co.
- Pillow Blocks:**
Canadian Link-Belt Company
- Pipes:**
Canadian Fairbanks-Morse Co., Ltd.
Canada Metal Co., Ltd.
Consolidated M. & S. Co.
Northern Canada Supply Co.
R. T. Gilman & Co.
- Pipe Fittings:**
Canadian Fairbanks-Morse Co., Ltd.
- Pipe—Wood Stave:**
Pacific Coast Pipe Co.
Mine & Smelter Supply Co.
- Piston Rock Drills:**
Mussens, Limited
Mine & Smelter Supply Co.
- Plate Works:**
John Inglis Co., Ltd.
Hendrick Mfg. Co.
The Wabi Iron Works
MacKinnon Steel Co., Ltd.
- Platinum Refiners:**
Goldsmith Bros.
- Pneumatic Tools:**
Canadian Ingersoll-Rand Co., Ltd.
R. T. Gilman & Co.
- Powder:**
Giant Powder Company of Canada, Ltd.
- Prospecting Mills and Machinery:**
The Electric Steel & Metals Co.
E. J. Longyear Company
Standard Diamond Drill Co.
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works
- Pumps—Pneumatic:**
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Sullivan Machinery Co.
- Pumps—Steam:**
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
The Electric Steel & Metals Co.
The Mine & Smelter Supply Co.
Mussens, Limited
Northern Canada Supply Co.
Smart-Turner Machine Co.
R. T. Gilman & Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works
- Pumps—Turbine:**
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works
- Pumps—Vacuum:**
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
The Wabi Iron Works
- Pumps—Valves:**
Canadian Fairbanks-Morse Co., Ltd.
- Pulleys, Shaftings and Hangings:**
Northern Canada Supply Co.
Canadian Fairbanks-Morse Co., Ltd.
The Wabi Iron Works
- Pulverizers—Laboratory:**
Mine & Smelter Supply Co.
The Wabi Iron Works
Hardinge Conical Mill Co.
- Pumps—Boiler Feed:**
Smart-Turner Machine Co.
Northern Canada Supply Co.
Canadian Fairbanks-Morse Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
Mine & Smelter Supply Co.
- Pumps—Centrifugal:**
Canadian Fairbanks-Morse Co., Ltd.
The Electric Steel & Metals Co.
Smart-Turner Machine Co.
Canadian Mead-Morrison Co., Limited.
Canadian Ingersoll-Rand Co., Ltd.
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works
- Pumps—Diaphragm**
The Dorr Company
- Pumps—Electric**
Canadian Fairbanks-Morse Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
Smart-Turner Machine Co.
- Pumps—Sand and Slime:**
Canadian Fairbanks-Morse Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Mine & Smelter Supply Co.
The Electric Steel & Metals Co.
The Wabi Iron Works
Smart-Turner Machine Co.
- Quarrying Machinery:**
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited
Mussens, Limited
R. T. Gilman Co.
- Balls:**
Hadfields, Limited
John J. Gartshore
R. T. Gilman & Co.
Mussens, Limited
- Railway Supplies:**
Canadian Fairbanks-Morse Co., Ltd.
- Refiners:**
Goldsmith Bros.
- Riddles:**
Hendrick Mfg. Co.
- Roller Chain:**
Hans Renold of Canada, Limited, Montreal, Que.
Canadian Link-Belt Co., Ltd.
- Roofing:**
Canadian Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.
- Rope—Manilla:**
Osborn, Sam'l (Canada) Limited.
Mussens, Limited
- Rope—Manilla and Jute:**
Jones & Glassco
Northern Canada Supply Co.
Osborn, Sam'l (Canada) Limited.
Allan. Whyte & Co.

Canadian Miners' Buying Directory.—(Continued)

Rope—Wire:

Allan, Whyte & Co.
Canada Wire & Cable Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.
Northern Canada Supply Co.
Mussens, Limited

Rolls—Crushing

Canadian Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
Hull Iron & Steel Foundries, Ltd.
Osborn, Sam'l (Canada) Limited.
Hadfields, Limited
The Electric Steel & Metals Co.
Mussens, Limited
The Wabi Iron Works

Samplers:

Fraser & Chalmers of Canada, Ltd.
C. L. Constant Co.
Ledoux & Co.
Milton Hersey Co.
Thos. Heyes & Son
Mine & Smelter Supply Co.
Mussens, Limited

Scales—(all kinds):

Canadian Fairbanks-Morse Co., Ltd.

Screens:

Greening, B. Wire Co.
Hendrick Mfg. Co.
Mine & Smelter Supply Co.
Canada Wire and Iron Goods Company.
Canadian Link-Belt Co., Ltd.

Screens—Cross Patent Flanged Lip:

Hendrick Mfg. Co.

Screens—Perforated Metal:

Hendrick Mfg. Co.

Screens—Shaking:

Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.

Screens—Revolving:

Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.

Schellite:

Everitt & Co.

Separators:

Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Mine & Smelter Supply Co.

Shaft Contractors:

Hendrick Mfg. Co.

Sheet Metal Work:

Hendrick Mfg. Co.

Sheets—Genuine Manganese Bronze:

Hendrick Mfg. Co.

Shoes and Dies:

Canadian Foundries and Forgings, Ltd.
H. A. Drury Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Hull Iron & Steel Foundries, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works

Shovels—Steam:

Canadian Foundries and Forgings, Ltd.
Canadian Mead-Morrison Co., Limited.
Osborn, Sam'l (Canada) Limited.
R. T. Gilman & Co.

Ship Bunkering Equipment:

Canadian Mead-Morrison Co., Limited.

Silent Chain:

Canadian Link-Belt Co., Ltd.
Hans Renold of Canada, Limited, Montreal, Que.

Silent and Steel Roller:

Canadian Link-Belt Co., Ltd.
Jones & Glassco (Regd.)

Siline:

Coniagas Reduction Co.

Saline Refiners:

Goldsmith Bros.

Smelters:

Goldsmith Bros.

Sledges:

Canada Foundries & Forgings, Ltd.

Smoke Stacks:

Hendrick Mfg. Co.
MacKinnon Steel Co., Ltd.
Marsh Engineering Works
The Wabi Iron Works

Solder—Bar and Wire:

Hoyt Metal Company.

Special Machinery:

John Inglis Co., Ltd.

Spelter:

The Canada Metal Co., Ltd.
Consolidated Mining & Smelting Co.

Sprockets:

Hans Renold of Canada, Limited, Montreal, Que.
Canadian Link-Belt Co., Ltd.
Jones & Glassco (Regd.)

Spring Coil and Clips Electric:

Canadian Steel Foundries, Ltd.

Steel Barrels:

Smart-Turner Machine Co.
Fraser & Chalmers of Canada, Ltd.

Stamp Forgings:

Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries, Ltd.

Steel Castings:

Canadian Brakeshoe Co., Ltd.
Canadian Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
Osborn, Sam'l (Canada) Limited.
Hull Iron & Steel Foundries, Ltd.
The Electric Steel & Metals Co.
Hadfields, Limited
The Wabi Iron Works

Steel Drills:

Canadian Fairbanks-Morse Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Northern Canada Supply Co.
The Electric Steel & Metals Co.
Osborn, Sam'l (Canada) Limited.
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited
Swedish Steel & Importing Co., Ltd.

Steel Drums:

Smart-Turner Machine Co.

Steel—Tool:

Canadian Fairbanks-Morse Co., Ltd.
H. A. Drury Co., Ltd.
N. S. Steel & Coal Co.
Osborn, Sam'l (Canada) Limited.
Hadfields, Limited
Swedish Steel & Importing Co., Ltd.

Structural Steel Work (Light):

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Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
Osborn, Sam'l (Canada) Limited.
Mussens, Limited
R. T. Gilman & Co.
The Wabi Iron Works

Sulphate of Copper:

The Mond Nickel Co., Ltd.
Coniagas Reduction Co.

Sulphate of Nickel:

The Mond Nickel Co., Ltd.

Surveying Instruments:

C. L. Berger

Switches and Switch Stand:

Canadian Steel Foundries, Ltd.
Mussens, Limited.

Switches and Turntables:

John J. Gartshore

Tables—Concentrating:

Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.

Tanks:

R. T. Gilman & Co.

Tanks—Acid:

Canadian Chicago Bridge & Iron Works
The Mine & Smelter Supply Co.

Tanks (Wooden):

Canadian Fairbanks-Morse Co., Ltd.
Gould, Shapley & Muir Co., Ltd.
Pacific Coast Pipe Co., Ltd.
Mine & Smelter Supply Co.
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Tanks—Cyanide, Etc.:

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Pacific Coast Pipe Co.
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Fraser & Chalmers of Canada, Ltd.
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Tanks—Steel:

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Canadian Ingersoll-Rand Co., Ltd.
Canadian Chicago Bridge & Iron Works
Marsh Engineering Works
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MacKinnon Steel Co.
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The Electric Steel & Metals Co.
Hendrick Mfg. Co.
The Wabi Iron Works

Tanks—Oil Storage:

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The Mine & Smelter Supply Co.

Tanks (water) and Steel Towers:

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Canadian Chicago Bridge & Iron Works
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MacKinnon Steel Co.
Mine & Smelter Supply Co.
The Wabi Iron Works

Tires—Auto, Truck and Bicycle:

Gutta Percha & Rubber, Ltd.

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Hadfields, Limited
- Transits:**
C. L. Berger & Sons
- Transformers:**
Canadian Fairbanks-Morse Co., Ltd.
R. T. Gilman & Co.
Northern Electric Co., Ltd.
- Transmission Apparances:**
Jones & Glassco (Regd.)
- Transmission Machinery:**
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Hans Renold of Canada, Limited, Montreal, Que.
Jones & Glassco (Regd.)
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- Trucks—Hand:**
Canadian Fairbanks-Morse Co., Ltd.
- TTrucks:**
Canadian Fairbanks-Morse Co., Ltd.
- Tubs:**
Hadfields, Limited
- Tube Mills:**
The Electric Steel & Metals Co.
Fraser & Chalmers of Canada, Ltd.
Hardinge Conical Mill Co.
- Tube Mill Balls:**
Canada Foundries & Forgings, Ltd.
Fraser & Chalmers of Canada, Ltd.
Hull Iron & Steel Foundries, Ltd.
- Tube Mill Liners:**
Burnett & Crampton
Fraser & Chalmers of Canada, Ltd.
Hull Iron & Steel Foundries, Ltd.
- Turbines—Water Wheel:**
MacGovern & Co.
- Turbines—Steam:**
Fraser & Chalmers of Canada, Ltd.
MacGovern & Co.
- Twincones:**
Canada Foundries & Forgings, Ltd.
- Uranium:**
Everitt & Co.
- Weighing Larries:**
Canadian Mead-Morrison Co., Limited.
- Welding—Rod and Flux:**
Prest-O-Lite Co. of Canada, Ltd.
Imperial Brass Mfg. Co.
- Welding and Cutting—Oxy-Acetylene:**
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Canadian Fairbanks-Morse Co., Ltd.
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- Wheels and Axles:**
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The Electric Steel & Metals Co.
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- Winches—Power Driven:**
Canadian Mead-Morrison Co., Limited.
- Winding Engines—Steam and Electric:**
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Canadian Ingersoll-Rand Co., Ltd.
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Canada Wire & Cable Co., Ltd.
Greening, B. Wire Co.
- Wire—Bare and Insulated:**
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Canada Wire and Iron Goods Company.
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- Wire Rope Fittings:**
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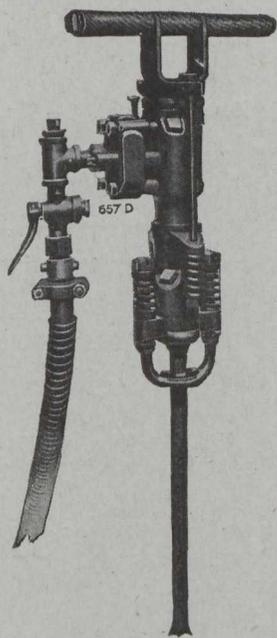
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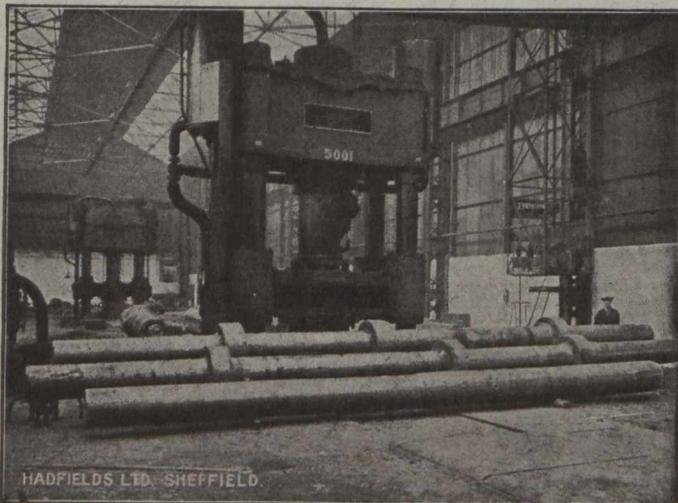
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