CANADIAN MINING JOURNAL

Vol. XLI. Garden City Press, Ste. Anne de Bellevue, May 7, 1920. No. 18.

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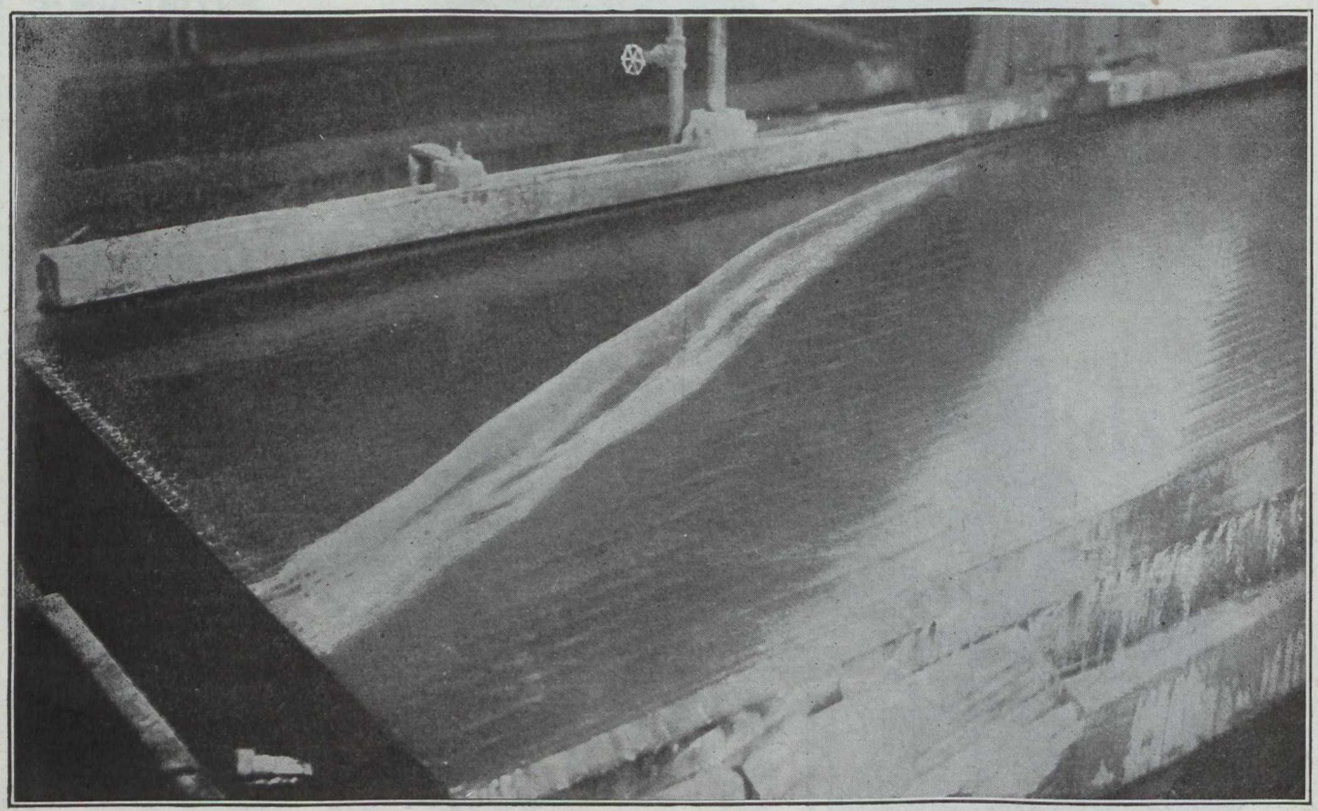

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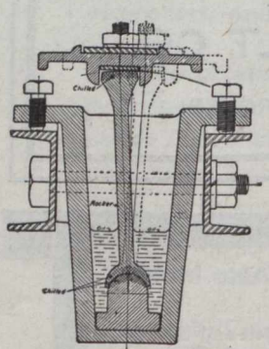

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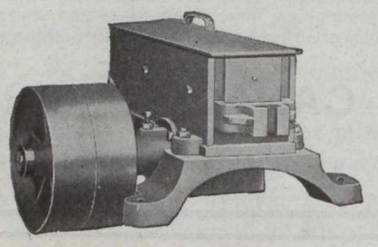

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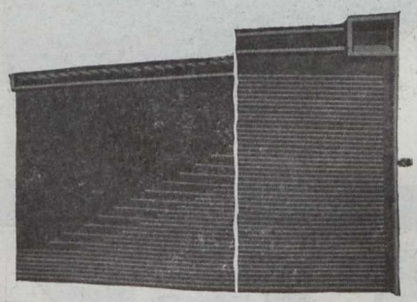

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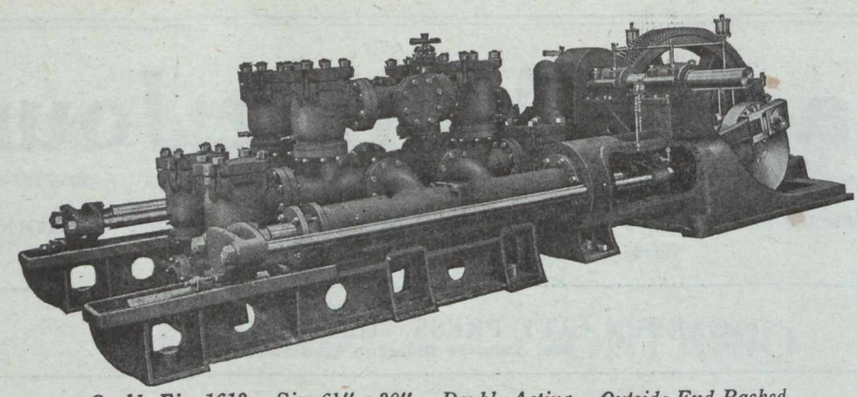

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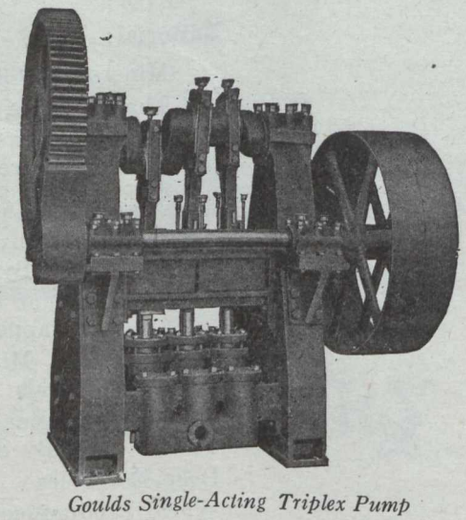

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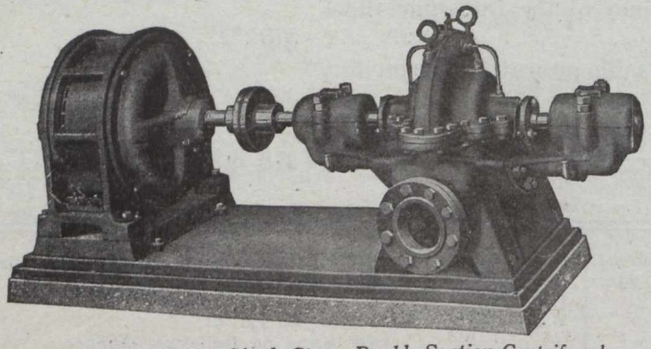

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EDITORIAL

Miners' Nystagmus

A paper was recently read before the Illuminating Engineering Society in England by Dr. Llewellyn on "Lighting Conditions in Mines with Special Reference to the Eyesight of Miners." The discussion which followed was taken part in by eminent eye specialists and authorities on the occupational diseases of the coal miner. Dr. John S. Haldane summarised the causes of nystagmus in words understandable by the laymen when he said it "was fatigue of some sort connected with the miner trying to see in the darkness", in which opinion he was supported by Dr. Shufflebotham, who congratulated the Illuminating Engineering Society on their joint endeavours with the Royal Society of Medicine to combat this nervous disease resulting from deficient illumination.

Dr. H. S. Elworthy suspected that some incurable cases of nystagmus were connected with rays from the violet end of the spectrum, and he gave figures intended to show that the incidence of nystagmus was greater in pits where owing to the colour of the coal there was a large amount of blue reflected from its surface. In this connection the occurrence of nystagmus cases in zinc mines, as noted by Dr. Stassen, is interesting.

Figures were given by Mr. Turner, of the Stafford Coal and Iron Company, showing that with the very best types of clean safety lamps the illumination at the face is only a small proportion of the candle-power of the lamp. In some instances, lamps over eight feet away from the coal-face gave an illumination of less than 0.01 foot-candle on the coal-face.

Dr. Llewellyn thought the miners' lamp of the future would be the electric lamp, and he directed special attention to the cap type of electric lamp, the alternative to which he said was an increase in the lighting power of the ordinary electric lamp to 3 or 4 candle-power, compared to an average of about one candle-power in standard types now on the market.

One speaker stated that the collieries with which he was connected had purchased 10,000 lamps of the "Ceag" type, which had been in use since 1912. He had noticed three things resulting from their use, first, a reduction of nystagmus, secondly, a reduction in accidents, and thirdly, the men were able to get away more quickly from the coal-face.

Mr. E. F. Fudge, speaking as Secretary of the Home Office Committee now enquiring into the question of miners' lamps, said that with the present form of construction there was no royal road by which the candle-power could be increased to the extent sufficient to prevent nystagmus. This applied both to the electric lamp and to the oil-safety lamp. He suggested more white-washing of the face and roads in the mine.

Is it not possible that makers of safety lamps are slavishly following older types, much as in the early days of electric lighting the manufacturers of lighting fixtures followed the design of Victorian gas fixtures? It is only recently that electric-light fixtures have shown signs of emancipation from the influence of gas-tubing. Dr. Llewellyn's remarks on the cap-type of the portable electric lamp show a hopeful tendency. In the United States and in Canada lamps of this type have proved to be excellent and safe instruments. They avoid the sensations of shock, and the effects of the vacillating flame that Dr. Stassen insists are so fruitful a cause of the nervous irritations that combine to cause nystagmus. Dr. Llewellyn stated that the chief symptoms of nystagmus, particularly the backward inclination of the head, were a result of the attempt to get the eyes in a position of maximum stability, convergence and depression, and at the same time to direct the line of vision forward. The cap-type of lamp would seem to admirably suit these requisite conditions of vision, and to supply all the deficiencies of which these symptoms are the proof. In fact, they might almost be quoted as a description of the characteristics of the cap-type of electric lamp with conical reflector.

The very general attention now being paid to the causation and remedy of nystagmus, and the combined efforts of illuminating engineers, eye-specialists and mining engineers above noted, should lead shortly to the removal of an occupational disease of miners that has not received any really concentrated attention in years gone by. We may hope, with Dr. Llewellyn, that "in this twentieth year of the twentieth century the long-continued supremacy of the farthing dip will be finally ended."

The British Steel Corporation, Limited

The progress of the negotiations for a consolidation of a number of coal, iron and water transportation enterprises of Eastern Canada has now proceeded to a point where it is proper to make public comment on a proposal that has been adumbrated for about a year. It is understood the consolidation will include the Dominion Coal Company, the Dominion Iron and Steel Company, and the associated undertakings attached to these two main subsidiaries of the Dominion Steel Corporation, and the Nova Scotia Steel and Coal Company with its subsidiaries and controlled interests, that include the Acadia Coal Company and the Eastern Car Company.

By the inclusion of the Canada Steamships Lines, which company it is understood controls the Century Coal Company of Montreal, Toronto, Port Colborne, Sarnia and Sault Ste. Marie, there is added a network of water transportation and coal distributing facilities that will very much broaden the scope of the Dominion and Scotia Companies' operations, themselves almost as much transportation companies as they are coal miners and steel manufacturers.

It is also stated that the Halifax Shipyards, the Davis Shipbuilding Company of Levis, the Port Arthur Shipbuilding Company, the Collingwood Shipbuilding Company and other smaller interests are to join the consolidation.

The scheme is vast, comprehensive, but we believe quite logical, and is—although we think it quite possible that few will agree with our viewpoint—but a resumption of the natural evolution of industries having coal as their base that was interrupted when the consolidated operation of the coal seams of Nova Scotia by the General Mining Association was abandoned in 1857 for the experiment of independent operation.

We have always believed that whatever financial stability attaches to the coal companies of Nova Scotia is a testamentary benefit conferred by the General Mining Association, and we ventured about five years ago to suggest that the only hope of settled prosperity in the Nova Scotia coal trade lies "in the development "of strong corporations, with adequate financial re- "serves."

The base of the imposing fabric of the "British Steel Corporation, Limited," so far as Canada is concerned—and for that matter so far as any other plans its promoters may have overseas are concerned—is built upon coal. On that foundation has been reared the acquisition of ore bodies, the manufacture of iron and steel, and all that implies, the acquisitions of lumber areas, and the coastwise and inland water traffic of Eastern Canada and the St. Lawrence waterway, and the assembly of all these activities under one head is but the family reunion,—with the added vitality that union always gives,—of the children of coal.

It is as a coal-mining consolidation that the merger of these various enterprises holds most significance, and we believe further holds out most hope for financial success for its promoters and real impetus to the industry of Canada. The aggregate production of the Dominion Coal Company, the Nova Scotia Steel and Coal Company and the Acadia Coal Company comprises ninety per cent of the coal production of Nova Scotia and probably ninety-five per cent of the capacity of the collieries of Nova Scotia for production.

It is interesting to note that the coal areas which are controlled by the associated companies are precisely those chosen in 1857 by the representatives of the General Mining Association when that Company relinquished its monopoly of the minerals of Nova Scotia, namely the areas at Springhill Mines, at Stellarton, Sydney Mines and Glace Bay.

It is not within the province of the "Journal" to comment on the propriety or otherwise of the far embracing, but we would repeat, essentially logical consolidation of interests that has been sketched for the public information in the newspapers, but as to the desirability of a consolidation of the operations of the Dominion Steel Corporation and those of the Nova Scotia Steel & Coal Company, there is in the minds of those who are best qualified to judge not the slightest doubt. The only regret that such a consolidation could occasion was that it had not been undertaken many years ago.

The attitude of the "Journal" as to the necessity of an agreement between the Dominion and Scotia Companies for a re-allotment of the submarine areas has not been in doubt. We have always contended that the best interests of both companies were to be served by an amicable agreement, **based on consideration of technical operation,** a condition that, as we stated in our issue of December 31st last, "will speedily become ap- "parent if a scientific, impartial and complete survey "of the problem is undertaken by competent persons." Such a survey has apparently been made, with a result that was a foregone conclusion. There was no escape from the conviction of any competent and unprejudiced group of men who examined the undersea coal area problem that continued independent operation of the undersea coal areas, with continued failure to come to agreement, would in time have spelled disaster to both rival companies.

The consolidated operation of the undersea coal areas off Cape Breton will not by any means remove all the problems that have to be overcome in the future of this unique field, but it will simplify them as no other single occurrence could possibly do, and it will enable concentration of expenditure and technical direction on the problem, in lieu of duplicate expenditure and the raising of man-made difficulties in the operation of a coalfield that is essentially one con-

tinuous deposit, requiring for its most perfect exploitation one continuous management.

We would command to those who have the direction of the policies of the new Corporation the suggestion that coal is the base of every activity of the thousand and one departments that will require attention, and that it is at the collieries where intensive capital expenditure to improve the capacity of the mines for output is most urgently required.

CANADA RANKS SECOND AS MINERAL PRODUCER IN EMPIRE.

Commenting on the mineral production of Canada in 1919, the "Mining Journal" of London, Eng., states:

"In common with practically all other mining "communities, Canada experienced a general de- "cline in its mineral output last year. Allowing "for the great expansions which took place in "Canada during the war, and arising directly from "the war demand, the falling-off was relatively "less than in other parts of the Empire, and to- "day Canada undoubtedly stands second only to "the United Kingdom in the importance of its "mineral industry. Not only so, but the Canadian "industry is very diversified, and in many direc- "tions has prospects of expansion which promise "to increase her lead over the other Dominions "and Dependencies. The extent to which Can- "ada is supplanting Australia as the premier white "mining community overseas is very marked. South "Africa is, of course, unapproachable as a gold "producer, while India has a big lead in coal and "manganese, but Canada, while possessing certain "special features of her own, such as nickel and "asbestos, has an all round strength which is the "best guarantee of regular prosperity."

The day is coming when Canada will produce much more coal than Great Britain, and may be relied upon to overtake India in this regard. Great Britain's coal reserves was in 1913 estimated at 189,533 millions of tons, including Ireland. Canada's reserve is 1,234,269 millions of tons. India's reserve is only 79,000 million tons, and is mostly coal of poor grade. There is therefore little doubt that Canada will one day be the mineral producer of first rank in the Empire, as it is now constituted.

It was only in the quinquennial period between 1895 and 1900 that the United States passed Great Britain as a coal producer. It is difficult to realize that 25 years ago the annual coal production of the United States was only 177 million tons, and that it is now in the neighbourhood of 700 million tons. Canada's rise as a coal producer may be commensurately rapid. Why not? We have more coal in Canada than in the whole of Europe, and next to the United States, we have more coal than any other single country in the World.

There are those who argue that Canada should use United States coal, as such a practice will tend to conserve Canadian resources. If it is intended that Canada should wait until the reserves of the United States are exhausted, then the matter ceases to have any interest for this generation, seeing that the coal reserves of the United States are estimated at 3,838,657 million tons. In the meantime, if our own coal reserves remain undeveloped, Canada occupies tthe position of not having any resources of domestic coal supply, because non-utilization of natural resources is equivalent to their non-possession for every practical purpose. It will be possible to gauge Canada's material growth by watching the curve of coal production, and just now, most unfortunately, Canada is not progressing, but is slipping backwards steadily and without immediate hope of recovery in the rate and tonnage of coal production.

How much longer will we submit to be, as a contributor to the "Journal" on the availability of anthracite recently remarked, the "last applicant at the final source of fuel" in the United States; where, as our contributor further remarked, Canada "can only ask for consideration, has no voice in any proposals developing or conserving production for her future necessities, no control over efforts to expand, no means to compel any change in policy, and no authority to force her needs." Who can doubt the correctness of his further statement, namely, that "the future fuel supply of Canada is a subject large and important enough to justify the continued attention of the Goernment, and should not be taken up and sidetracked as crises from varying causes rise and disappear. It is a problem greater and more Dominion wide economic importance than much of the work now being undertaken by numerous Government departments."

NIPISSING MINES ANNUAL MEETING

Shareholders of the Nipissing Mines held their meeting in Toronto on Monday and listened to satisfactory reports concerning the years operation. During the meeting the question was raised as to why the dividend was not higher than 20 per cent. in view of the large surplus of the company, now standing at $4,372,952, an increase of nearly one million for the year. President E. P. Earle of New York, replied that a good deal of the surplus was in the form of investments in Victory and Liberty Bonds, amounting to $1,375,000 in the former and $340,000 in the latter, and that, having regard to the bond market, the company was inclined to pay heed to a feeling of the Government and hold the bonds for some time rather than throw them on the market and to that extent, furthed depress prices. Further dividend disbursements would be made as soon as possible. It was stated in regard to the company's oil lands that in the Texas field, drilling had reached 2,800 feet and the Ranger sands occur at about 3,400 feet. The former board of directors were re-elected.

SAFETY LAMP GAUZES

By JAMES ASHWORTH, Livingstone, Alberta

It is now more than one hundred years since Sir Humphrey Davy experimented and produced the well known safety lamp which still bears his name. Its construction has for all practical purposes never varied. The confidence of mining men in its safety and utility in mines has been unaltered through all these years, and even at the present day there are scores of miners who would enter the most dangerous gassy and dusty coal mines and use it with the utmost confidence.

It is, however, a fact that some of the warnings of its inventor were not heeled at first, and, moreover, the later warnings of observant mining men who detected some of its weaknesses, have not been heeded either; thus Sir H. Davy said, that the the gauze needed shielding from strong air currents, but some time elapsed before the lamps of this type were fitted with tin shields, for the whole height of the gauze but more generally for only part of the height. In time the tin shield was partially replaced by a cylindrical glass shield in this form and called the "Jack Lamp." Almost contemporaneously the Stephenson and Clanny types of lamp came into use, but they were never regarded with the same degree of confidence as the Davy, becaus the glass parts were looked upon as being dangerous; and not even the improved lighting value of the Clanny has been able to entirely displace the Davy.

Explosions, however, began to occur where Davy lamps were in use, and various committees and individual men commenced to make experiments, ALL of which showed that the Davy was not as safe a means of lighting a mine, as was popularly thought. Amongst the doubters was a Mr. Darlington (1852), and previously also Dr. Priara (1833) whose energies resulted in the Upton & Roberts safety lamp. The last named safety lamp was a thoroughly well shielded Davy Lamp, but it was very much heavier than the Davy and had not any better lighting value than the Stephenson (Geordie).

The North of England Institute of Mining and Mechanical Engineers appointed investigating committees and experiments were also made by some of its members from time to time, and still nothing definite resulted.

However about 1878-79 following the explosion at Haydock, near St. Helens, Mr. Smethurst of the Garswood Hall Colleries, Wigan, England, erected a testing gallery at one of the collieries where pure methane was piped up one of the shafts from the Six Feet mine, and being joined by the writer commenced experimenting on all safety lamps then in use. The results of these experiments were reported from time to time to the North of England Institute of Mining and Mechanical Engineers, the Secretary of which was Mr. Theo. Wood Bunning. This gentleman was deeply and practically interested, and he induced his Council to arrange to call a meeting of representatives from all the British coalfields to consider what ought to be done to improve the safe lighting of Colleries, and to ask the Government to take up the matter with a view to legislation. After this meeting had been arranged and just before it was to have been held, the Government took a very unexpected move and astonished the whole mining community by appointing the Royal Mines Accident Commission. This Commission commenced its investigations with the apparatus used by Messrs. Smethurst and Ashworth, and its report, which is known all over the world, was published in 1886, and so far as safety lamps were concerned, they selected four which seemed to them to have given the best results, viz., the Marsaut, (3 gauzes), the Gray, the Evan Thomas No. 7, and the bonneted Mueseler; all of which were bonneted lamps. But none of these lamps excepting the bonneted Mueseler are in use to-day.

Since then hundreds of patents have been taken out for new patterns of safety lamps, and for various small improvements in safety and lighting value, and yet here we are in 1920 still struggling with the question of a safe safety lamp. Just to show that the matter is considered of great importance it may be interesting to note that the British Government have an official Committee now engaged on a fresh investigation of miner's safety lamps.

It is a remarkable fact that although fine coal dust has often been suspected of reduciing the safety value of miners lamps, yet as a factor in experimental tests it has been neglected, and may be said to be so still.

The writer whilst conducting safety lamp tests for the North Staffordshire Institute of Mining and Mechanical Engineers safety lamp committee 1879, made an accidental discovery; thus, it was proposed by the committee to commence the tests with an explosive mixture of coal gas, (town lighting gas), and air, having a velocity of ten feet per seccond, but as the volume of gas was insufficient, it then seemed as if tests would have to be abandoned untill a larger connection could be made with the gas mains. On looking around a sack of fine Eight Feet Bambury coal-dust was noted, which had been specially collected from the roadway of a mine (where there had been at least two explosion disasters), for another committee which had been engaged in making tests with explosives and coal dust. A small handful of this dust was placed on the floor of the lamp testing gallery, on the windward side of the Davy lamp under test, whilst a low velocity of current of 370 feet per minute, consisting of air with 4½ per cent of gas, just licked up what is best described as a normal per centage of the dust. The result was startling, as the lamp quickly showed the effect by becoming red hot near the top of the gauze, and exploded the surrounding atmosphere in eleven seconds. This experiment was repeated many times and the flame passed at times in as little as ten seconds.

This experimental result was communicated to the North of England Institute of Mechanical Engineers, and of course to the North Staffordshire Institute of Mining and Mechanical Engineers, and the records are to be found in the transactions of both Institutes, in the 1879-80 of the former.

The writer does not know of any other experiments having been made in England with the same combination, and why it was not taken in hand by the Government when the Mines Accidents Commission commenced to test safety lamps it is now impossible to say. The next English Royal Commission which was appointed to investigate explosions from coal-dust, did not touch the subject of safety lamps at all, and thus we have now reached the year 1920, after a lapse

of forty years before the subject seems to have awakened mining men to its great importance.

Possibly a real awakening is now in prospect, something comparable to the early morning sun peeping up on the eastern horizon, ts there is actually a Miners' Lamp Committee, composed mainly of officials connected with the British Home Office Department, making an investigation.

In 1919, Mr. T. J. Thomas, of Porth, South Wales, contributed to the "Colliery Guardian," of London, a series of articles on safety lamp gauzes. These articles were spread over many months, and whilst reporting the work of those who have in the past devoted their time and energies to the safe lighting of coal mines, show minute thought, and the sound reasoning on which he has based his conclusions.

He commences from the earliest period, beginning of course with Sir Humphrey Davy's work on wire and wire gauzes, and in this regard has deduced facts which demonstrate most clearly that the Davy wire gauze (composed of 28 iron wires of 0.0148 diameter (28 S.W.G.), with 784 apertures of 0.0209 diameter to the square inch), is in all respects superior to any of the Continental standard-gauze meshes. Sir H. Davy's rule was that if a wire gauze could be improved it would be by increasing the radiating or cooling area, and not as was the rule of the late M. Marsaut, by reducing the size of the aperture and using finer wire than that of Davy, and showiing that he attached less value to the radiating surface than to the area of the apertures.

The standard wire mesh of France, Belgium and Germany in 1912, had a diameter of wire of 0.3 m/m.; mesh 14; apertures per square cm. 196; diameter of the apertures 0.5 m/m. (0.01969); total surface of wire in one cm. 2.06 and the total open space in one cm. 0.4096.

In none of the gauzes tested by Sir H. Davy (1/40 to 1/60 of an inch), did the diameter of the aperture equal its depth. The nearest size was 28 B.W.G. (0.020 inch wire), with 24 mesh (578 aperture per square inch wire. It is curious that no one has experimented with a 25 mesh, made of wire of 0.020 diameter, which would give an aperture of 0.020 diameter. This is smaller than the aperture in our standard mesh, and practically equivalent to the aperture in the Continental standard mesh of 0.5 m/m or 0.01969 inch. A gauze made of 25 B.W.G. 0.020 inch diameter (1/50th), of 25 mesh would give 625 apertures per square inch, with the same open space as the standard gauze, of 784 apertures per square inch.

The Continental standard wire for gauzes is made of wire of No. 30 S.W.G., and is 0.0124 inch diameter, or 0.0024 less in diameter than the British.

Sir H. Davy to get as much useful effect out of his safety lamp as was possible, made it 8 to 10 inches high, and 2 to 2½ inches diameter, to give good lighting value, he further proposed a gauze cap on the top of the main gauze, and also a tin shield. This possibly was the origin of the Scotch gauze or Blantyre miners lamp 3 inch diameter by 10 inches high, but the Davy lamp as generally used was only 1½ inches diameter by say 4½ inches high.

In Sir H. Davy's day the air currents in coal mines were of low velocity, and the air impure in comparison with today, and hence both the Davy, the Stephenson and the Clanny proved to be safe and reliable under the then circumstances. But when ventilation became more efficient, and with higher velocities, the confidence in the lamps did not decrease, and they became like heirlooms handed down from father to son with all their traditions. As before noted, possibly Dr. Darlington was the first, or one of the first, to call attention to what he thought was a danger of the lamps from the presence of coal dust in the air. This was in 1852, at which time Dr. Darlington thought that the danger arose from coal dust in a state of incandesence flying off red hot gauzes.

Before mining men began to suspect that the Davy Stephenson and Clanny lamps, were unsafe in their early form of construction, suspicion fell on blasting because explosions were caused under certain conditions when coal dust alone was present, and when no detectable percentage of fire damp (methane was found in the ventilating current. Following this suspicion a great many private experiments were made to demonstrate without a shadow of a doubt, that coal dust was, when very fine and mixed with the ventilating current, an explosive which could wreck a mine much more effectually than a mixture of air and methane. And yet in spite of these demonstrations of the danger attached to the very fine coal-dust found in most coal mines, only a very few persons recognized that the arguments might at the same time be applied to all means of lighting collieries. In addition to this information re coal dust, various savants, Professor B. Phillips Bedson for instance, proved that coal dust was not merely very finely divided coal, but that when fresh it contained occluded gases which helped to make the very fine dust float in the air. Thus we always have a very finely divided solid carried along in its own balloon of gas.

Mr. T. J. Thomas, who has been referred to before and from whose work many quotations will be made, says in one of his articles, "what we are evidently try-to do in our mines today is to resist the passage of the flame from the inside to the outside of a gauze in a safety lamp, with a mesh which will not resist for longer than two minutes the passage of an inflammable mixture of methane and air in the proportion of about the lowest inflammable mixture, having a velocity of only 7 feet per second. It is obvious that if fine coal dust is coming into contact with a reated gauze there must be an evolution of coal gas from the dust. **This is the explosive mixture of unknown composition,** varying in composition, which increases the inflammability as the temperature of the gauze rises, and yet we are trying to resist it with this standard mesh. Our aperture of 0.0209 inch is greater than half the diameter of the mesh which passes flame when strongly heated, and in our standard mesh the absorbing and radiating surface is increased by 0.2 square inch,—these meshes were safe when cold, but will pass the flame when strongly heated, or when subjected to any motion.

Mr. T. J. Thomas again remarks, "It is remarkable that lamps with double gauzes should only have been submitted to test with 8 per cent of coal gas by the Royal Mines Accidents Commission at Woolwich Arsenal. (See the report of the experiments published in the 1886 report). What value these tests have in showing the resistance of the mesh to the flame of firedamp and air in a Marsant lamp, Mr. Thomas finds it difficult to discover. It is known that if we throw a quantity of fine coal dust on to a metal plate at a dull red heat, we shall get an evolution of coal gas, and it is evident that we get a certain amount of

coal gas produced when coal dust comes in contact with a safety lamp gauze which is at a dull red heat. Enrique Hauser ("Researches on Firedamp" Transacs of the American Institute of Mining Engineers 1916), states that he obtained ignition of a mixture of coal gas with a limit of inflammability of 8.5 by using five parts mixed with 4.5 parts of firedamp, the illuminating gas forming therefore 54 per cent by volume of the two inflammable gasses. This ignition was obtained by the fusion of a ferro-nickel wire of 0.3 in diameter.

We are trying to prevent the flame passing, in possibly a mixture of this kind, with a mesh which will not resist the action of the lowest explosive mixtures of methane and air for any length of time.

A mesh of 900 apertures per square inch made of S.W.G. wire (0.0148 inch in diameter), 30 meshes per inch gives an aperture in diameter of 0.01853 with a wire surface of 2.788 square inches and a total open space in each square inch of 0.320 inch. Mr. Thomas thinks that with two superposed gauzes it could not be used in an ordinary safety lamp. The apertures of this mesh would be smaller than the mesh in use on the Continent.

Mr. T. J. Thomas expresses the opinion that we have long passed the limit when gauze can be relied upon for safety in fiery dusty mines. Thus when there is a continuous flame of burning firedamp in a miner's lamp in a coal mine, which has fine coal dust floating in the air the lamp ceases to be a safety lamp that can be carried about.

Probably the products of combustion when passing through a heated gauze may become decomposed and affect the result.

We are quite certain that the safety of a safety lamp is also affected by the air pressure in which it is being used, thus, take the case of the Viviers Reunis mine, at Charleroi, in France, with the barometer standing at 30 inches on the surface the pressure of the air is increased to 33.9 at a depth of 3500 feet, and thus would naturally increase the lighting power of a safety lamp, but of the effect of this extra pressure on the safety value of the lamp we practically know nothing.

Mr. T. J. Thomas calls attention to another point which would seem to require careful investigation, viz., as to what is the most suitable metal to use for miners' safety-lamp wire gauzes, thus, he gives reasons why steel wire ought NOT to be used, and why we should retain the iron wire as having been distinctly specified by Sir Hunmphrey Davy. He is also of opinion that a copper wire gauze is not as safe to use in a fiery mine as is iron wire. In this regard probably most mining people will agree with him, his argument being that copper occludes oxygen and therefore is one of the most dangerous substances to use in a gauze, and further that Sir H. Davy preferred brass wire.

Naturally, the force of an explosion within a safety lamp gauze or gauzes affects the safety of the lamp.

Mr. Thomas frequently uses the expression "internal detonation" and therefore assuming that detonation can take place under certain conditions, then we have another possible danger to provide against, seeing that the speed of such an explosion may be more than 3,000 feet per second.

Then again we know as a definite fact that the word firedamp covers many other gases besides methane, such as ethane, propane, and hydrogen, and therefore even a small percentage of any one of these gases will greately increase the danger of lighting a fiery mine. For instance, the failure of a perfectly sound double gauze Marsaut (Wolf gasolene pattern), caused an explosion at No. 3 mine Michel, B.C., as soon as the miner reaching his working place had hung his lamp. (See paper on "Firedamp" in the February, 1920, Canadian Mining Institute Bulletin).

Another suggestion which Mr. Thomas throws out is based on his reasoning that as one, two or three, superposed gauzes do not make a safety lamp safe in a fiery dusty coal mine, that some other construction should be adopted in which the gauze part is only exposed to the minimum of danger from the ignition of firedamp within the lamp. This does not seem feasible at first sight, but he quotes the Hailwood Combustion lamp, in which, as it is of the Mueseler type, there is only the disc gauze exposed to an explosive flame, in which case the flame is probably passing away from the gauze and therefore does not impinge on it and cannot dangerously heat it.

The Mueseler type of safety lamp is not, however, entirely immune from a certain amount of liability to fire the outside atmosphere, and therefore it is well to examine and find out if possible what are its weak points. Undoubtedly, the most likely part to show its weakness is through the open chimney, thus if the current of air and gas through the lamp becomes reversed, and does not extinguish the wick flame on ignition, or gas continues to burn under the disc gauze at the foot of the chimney, the explosion within the glass part of the lamp may be sufficient to carry the flame through the large gauze covering the top part of the lamp. The other risk is that the explosion of gas and dust within the glass part may carry the flame through the disc gauze at the foot of the chimney and into the top truncated or cylindrical gauze and thence into the mine atmosphere. Another danger arises from the fact that in a brisk ventilation if the gas continues to burn under the disc gauze after the first explosion at the wick flame it may continue to burn on the windward side and pass the products of combustion out through the same gauze on the lee side of the chimney, in which case the chimney may become a downcast and ultimately be the means of carrying the flame up and out through the main gauze. In the failures of this type of lamp it is very difficult to make sure how the failure occurs because as a general rule burning gas and the wick flame are both extinguished by the first explosion within the glass part. The writer has always considered the chimney to be the weakest part of the Mueseler, and therefore when making an improved Mueseler safety lamp he added a protection to the top part of the chimney to stop the possibility of a down-draught, and also a small circular truncated conical shield to cover the disc gauze, with of course a space between, to prevent any double current, that is, from the windward to the lee side, as referred to above,) (See paper on the Davy and Mueseler types, 1879-80, Transactions of the N. of E. I. of M. & M. E.)

The Mueseler type of safety lamp has been unfavourably received because of its almost certain extinguishment if thrown over or placed very much outside its perpendicular position, and hence the Clanny and the double gauze lamps have taken the lead. But even with this disadvantage the type is undoubtedly coming into favour again with the additions of what amount to small alterations in construction. One of the

best known of these is the Hailwood in which a high lighting value and, of course, a better combustion at the oil wick flame has been attained, by adding a small cylindrical glass to the base of the chimney and extending it down to the level of the wick flame, also with a cowl or protection to the top of the chimney to protect it from any down-draught current. Like many other modern designs, that of the Hailwood Combustion lamp is not entirely new, but presumably it is the combination and difference in the dimensions of the parts which constitute the patent; and, judging from the writer's practical and experimental experience he would expect to find that gas might be ignited and continue to burn under the disc gauze between the two glasses.

Another modification of the Mueseler type has also been patented by the Patterson firm of safety lamp makers, and is called the Patterson.—In this lamp the alterations are a combination of the Mueseler and Gray types.

There are also some other alterations in the details which do not materially affect its safety value. A higher lighting value is claimed for this lamp than for the Hailwood, and that there is only one glass for the light rays to pass through, and also that the glass part is less liable to become fouled by smoke from the wick flame. The gauze ring below the glass part of the Gray is replaced by a perforated brass ring one-eighth of an inch thick. In regard to this perforated ring it is to be noted that the Prussian Safety Lamp Commission, 1880-1887, decided that perforations through a metal plate were not as safe as standard wire gauze, but as the lamp has received the approval of the British Home Office it has evidently passed safely through the Eskmeals testing station. It may be observed, however, that the tests made at Eskmeals are made to pass the lamps through a fixed series of tests so that all safety lamp tests are made to one standard, and not to find out any particular weakness of design or construction.

There is, however, one notable claim for the lamps points of excellence which is extremely novel, viz., that of passing the inlet air twice through the *same* gauze, to double the resistance to the passage of flame, whereas the only practical effect is to increase the friction of the incoming current of air. A deflector plate is also fitted inside the shield touching the cylindrical gauze about half way up the height of the shield, which thus to some extent separates the ingoing and return air currents. Some value is claimed for the lamp as a gas detector, but the section shows that it does not permit the atmosphere to be tested to enter at any point nearer to the roof than any ordinary lamp, and in this regard is a long way behind the lamps of the true Gray type, neither is there any arrangement to save the wick flame from extinguishment from excess of gas, by admitting gas-free air at the lower end of the inlet air tubes, as in all Gray and Ashworth-Gray patterns.

Whether or not this pattern of safety lamp is immune from the possiblility of a down current in the chimney is a point which could be ascertained by experiment, but like the true Gray patterns it has a very limited space within which the ignition of an explosive mixture of air and firedamp can take place.

Having thus called attention to the main points of these two safety lamps, both of which have been specially designed to give an excellent light to the miner whilst at work, one being of the true Mueseler type and the other one mostly like the last pattern of Major Gray, the patentee of the original Gray, it remains to refer to the latter as well as to the Ashworth-Gray patterns.

All of these have a deflector plate around the wick flame to bring the incoming air for combustion into intimate contact with the wick flame, and thus improve the lighting value; some patterns have the chimney inside the gauze part as in the Patterson pattern, but lamps of the true Gray type have the gauze part inside the chimney—the difference in practice being that no coal dust can settle on the gauze when placed inside the chimney, and also it cannot become red hot. Therefore the lamps at this point are secure from the dangers which Mr. T. J. Thomas has called special attention to. The glasses of all patterns of Gray may be either cylindrical or conical—the original Gray having a cylindrical glass and most of the Ashworth-Grays, truncated conical glasses. The practical difference is that the latter form is stronger than the cylindrical, has smaller cubic contents and gives a superior roof light. All patterns of the Gray type have been specially designed for firemen and firebosses use, as the best detectors of firedamp and at the same time to give a superior illumination with less than an ordinary expenditure of oil or spirit or whatever illuminant is preferred by the firm using them. The outstanding features of the Gray type are (1), that it is impossible to make *any* gauze part red hot; (2) that the ventilating current within the lamp *cannot* be reversed when an ignition of firedamp occurs inside the lamp; (3) that if the lamp wick flame is not extinguished along with the gas the gas flame can only burn out of contact with the gauze ring, and thus it is impossible to overheat this gauze.

Another advantage of the Gray type of safety lamp is that the whole of the air entering the lamp is exposed to the wick flame and consequently the products of combustion become a really extinctive gas. A still further advantage is that it is the only type of safety lamp in which the air necessary for combustion, and the products of combustion, both pass through openings of standard size and therefore there is no danger of an excess volume of explosive current entering the lamp.

The patent rights of the Gray and the Ashworth-Gray constructions of safety lamps have long since expired, and therefore as there are no royalty charges these lamps ought to be supplied at very reasonable price, though at the time the patents were in effect, the sale of them was made almost impracticable in competition with bonnetted Clanny lamps selling at such prices as one dollar to a dollar and a half each.

Both the Hailwood and the Patterson are as expensive to manufacture as either the Gray or the Ashworth-Gray, and hence the prime cost does not seem to enter into the controversy, and consequently only the lighting values and safety points need to be taken into account. As regards safety in particular, it may be assumed without question that all the above named lamps are *safe*, as they have passed the British Home Office tests at Eskmeals.

It would make very little difference to the lighting value of any of the modern lamps named above if the new and more resistive gauze mesh suggested by Mr. T. J. Thomas were adopted and therefore the sooner it becomes the standard size the greater will be the margin of safety.

Since the partial introduction of electric lamps into dangerous mines, it has been impossible to carry out the rules of the Acts of Parliament in regard to the

testing for methane, and other gases, and therefore the safety lamp makers have been vigorously struggling to perfect oil safety lamps of higher lighting values than the electric, which can be used for testing for inflammable gases and also conform to the rules for keeping a mine safe. The makers claim that these high powered oil lamps give a better all-round light to the miner, are also better for his eyes, and therefore that they will enable a miner with nystagmus eyes to continue at work underground. What causes nystagmus has been debated for a score of years, and is still an unsettled question, but the majority of doctors and others incline to the insufficient light as the reason—others say it is "glass glare." Both these possible causes have now been provided for, thus, all the newest safety lamp designs provide for increased lighting power, and such lamps as the Hailwood Combustion lamp are shielded by the frame which carries the inner glass; all of the Gray type lamps may have one single flat air tube instead of tree or four round ones, the same with the Patterson. The flat tube arrangement also permits it to act as a reflector, or white enamelled glasses (which the writer patented many years ago), might be applied to the Patterson or any other type. If the English Home Office Committee take up the question of gauze versus perforated metal, and decide in favour of the perforated metal, then we can have these safety lamps made entirely without gauze parts, and in this way replace Sir Humphrey Davy's gauze with George Stephenson's perforated metal plate. The writer thinks, however, that the majority would prefer the gauze and the higher powered oil lamp rather than the electric lamp, or at any rate until the electric lamp can be used for gas testing purposes.

In concluding these notes, the writer would impress on every one vitally interested, that no matter what our personal prejudices may be, we should *make* "Safety the First Consideration," and in this practical way do something towards minimising such fearful disasters as colliery explosions.

CONSOLIDATION OF INDUSTRIES BASED ON COAL A LOGICAL HAPPENING.

Abstracted from a Review of the Steel Industry since the Armistice by the Editor in the Christmas Number of the "Grain Growers' Guide".

It is in the logic of events to anticipate a consolidation of interests, including coal mines, iron-ore deposits, steel plants, and steel-ship building yards, along the lines that have been so successful in Britain, where it is often stated that the ore comes in at one gate and the steel ship goes out at another. It is possible by a consolidation of such allied interests, which are all founded upon coal and the heat that comes from coal when burned, to utilize that heat more completely and scientifically when all the surplus gasses, and the by-products of combustion are concentrated in a compact area, enabling process to follow process without loss of time or heat, and facilitating what is today known as straight line production. If such consolidations take place in the future, they should not be looked at askance, or regarded as undesirable, but should be recognized as the only way in which our basic industries of coal-mining, steel manufacture and shipbuilding can be developed to a point where they can stand on their own legs and enter the competitive markets of the world.

The weakness of the steel industry in Canada lies in its too great dependence on the United States for supplies of iron ore and coal. Only five per cent of iron ore reduced in Canadian furnaces is mined in Canada, although a large tonnage, at least 900,000 tons annually, comes from the Canadian owned mines at Wabana, Newfoundland. Canadian iron ores are plentiful, and well distributed, but they happen to be temporarily discounted in value by the more accessible, cheaper and more easily reducible iron ores on the United States' side of the Great Lakes. Some day, Canada's ores will prove a source of great wealth. In the matter of coal, Canada can, to a much greater extent than she has hitherto done, please herself whether she mines coal at home or goes to the United States and pays out good money for coal there. Canada has lots and lots of good coal, and is under no compelling necessity to spend some $50,000,000 annually in the purchase of United States coal.

An interesting subject at this time is the desire of British Columbia to have a steel industry in that province. The permanence of the ship-building industry there almost requires a steel industry on the Pacific coast, and the probability is that before long a beginning will be made in the manufacture of steel, and possibly in the reduction of iron ores to pig-iron, in British Columbia. Wherever coal is found of suitable quality, and in sufficient quantity, an iron and steel industry is bound to follow the development of the coal fields, even should it necessitate the transportation of iron ore and fluxes for some distance, because the metal industries, from the mining of the metalliferous ores to the final fabrication of the finished metal, are entirely dependent on coal for motive power and heat—with some notable exceptions where large quantities of electricity generated by water-powers are available. Coal is the most important and basic raw material of the modern world. It is a first necessity of national defence and national independence, and no country can achieve industrial importance without coal. Therefore, that country which is most generously supplied with coal is most likely to lead in industry. In Canada, that most favored district is Alberta, which has within its borders more coal than all the remainder of Canada, and more coal than any one state in the American union.

Book Reviews

MICROSCOPIC EXAMINATION OF THE ORE MINERALS. W. Myron Davy and C. Marson Farnham. First Edition. Mc. Graw-Hill Book Co., New York. 154 pages with Indices. 6 ins. by 9¼ ins. Cloth Boards.

This work deals with the technique of polishing and examining the specimen, and with the photomicrography of polished sections. The main feature of the volume is a series of determinative tables, to which a thumb index is given. The index is arranged as to order of reagents used in identification. A number of supplementary tests are detailed. The examination of polished specimens of ores is in the work referred to as "mineragraphy" following the analogy of the better known term of metallography. The work is intended for advanced students and for professional reference in the laboratory. The printing, indexing, and general arrangement of the work leaves nothing to be desired.

Miners' Nystagmus

(By SIR J. COURT, M.R.C.S.)

Miners' Nystagmus in the coal mines of Europe, its cause and cure, have been thoroughly investigated during the past thirty years. There is no doubt that the opinions, held by the majority of experts, that the deficient light of the safety lamp is the chief cause of the disease has led to great improvements in the illumination of collieries and in the construction of lamps. It may be said, therefore, that the greater the light the less the disease. It has been affirmed, with much truth, that miners suffering from myopia hypermatropia or astigmatism are more liable to develop the trouble than those men with normal vision. A high proportion of nystagmus cases have been found to have errors of refraction, a high proportion also of all adult working men have errors of refraction, and the same will be found in school children. Nevertheless, when these men work in naked light pits they seldom develop nystagmus. The condition of lighting in all mines should be made equal, or better than where naked lights are used. There is also a personal factor in some of the cases of nystagmus. It is remarkable that so many young men have tthe complaint. I have seen two brothers under 25 years of age suffering badly.

Many of the bad cases of nystagmus also suffer from photophobia and night blindness, and they cannot go out of darkness into bright light without shading their eyes and throwing back their heads.

Owing, however, to the great improvement in the lighting, especially by electricity, in all the collieries of Great Britain, these bad cases are nothing like as common as they were ten years ago.

Exhaustion and fatigue have a bad effect upon some cases, and they suffer much more at the end of the day than their fellow miners. Others are very depressed in mind, and when insanity is inherited the nystagmus might possibly be an exciting cause of it. Nystagmus should therefore be looked upon as a neurosis, because of the headaches, giddiness and tremors which so often are present in bad cases. These miners ought to have special attention, and any means to help them to avoid eye strain should be adopted. Many of them complain of the unshaded light of the safety lamps, and also the white light of the electric lamp. Although they can get more coal and with much greater ease with the electric lamp, the white light is irritating when looked at.

Probably some kind of glass could be used in an improved lamp which would overcome the glare caused by the ultra violet rays of the white flame. Amber coloured glass has been used with advantage by oculists for eyes which are sensitive to bright light. Either this or Sir A. Crooke's smoked glass should be tried, either by the whole bulb of the lamp or a shade made to cut off a quarter of the light so as to relieve the eyes from the glare without diminishing the light directly in front where the miner is at work. Another advantage of an amber coloured glass is that it gives a better definition of the object looked at.—Medical Times (Eng.) Mch. 1920.

Deep Boreholes

At a meeting of the Geophysics Committee of the British Association, held in London on February 6, a discussion took place upon the subject of deep boreholes. The debate was opened by the Hon. Sir Charles Parsons, who had previously put forward a suggestion that it might thus be possible to tap the heat of the earth's interior and utilize it as a source of energy at the surface. The project naturally strikes the imagination, and it does not at first sight appear to be beyond the realm of practical engineering, especially as something of the kind has already been accomplished at La Darello, in Italy, where volcanic heat, in the form of high-pressure steam, is already developing 10,000-horse-power, and other projects are on foot for turning to practical account the heat of Vesuvius.

We venture to call attention to this discussion for several reasons. In the first place, the possible, utilization of any natural sources of energy—more particularly in a country like Italy, where coal has always been an expansive luxury, and is now almost unobtainable—assumes a position of real economic importance. In the second place, our knowledge of the rate of increase of temperature in the earth's crust is still far from complete, and mining engineers cannot but take deep interest in any investigation which is likely to throw light upon it. In the third place, we are still lacking in precise information respecting the condition and behaviour of rocks at considerable depths below the surface. And finally, great importance must necessarily be attached to the views of practical engineers as to the limits of depth it would be possible to reach with the resources now at our disposal.

Upon all of these points the discussion referred to above afforded useful and highly interesting information. Let us take, in the first place, the rate of increase of temperature. It is a striking fact that, so far as actual experience in other countries has gone, the average rate of increase of temperature with depth, as measured in English collieries, seems to be altogether abnormal. The geothermic gradient estimated by this criterion is genarally assumed to be about 72 ft. per degree Fahr., but in Brazil, in the Morro Velho Mine, where a shaft has been carried down by successive steps to a depth of 6,426 feet the rate of increase of temperature is less than one-third of this amount. The same conclusion is reached in the Rand mines of South Africa, where a shaft at the Village Deep mine has reached 5,400 feet in vertical distance below the surface, and the geothermic gradient has been found to be about 250 ft. per deg. Fahr. The apparently exceptional and steep heat gradient found to exist in the British area at one suggests that some special local reason for it may exist, possibly of a chemical character, and there is no absolute certainty that the same rate of increase would be maintained in deeper workings. This, however, is pure conjecture, and can only be put to the test by actual experiment.

As to the practical limit of a deep borehole Mr. Hugh F. Marriott, whose experience in the deep mines of South Africa lends exceptional authority to his opinion, thinks that it would not be possible to carry a borehole down much deeper than the one recently sunk in West Virginia, which reached a depth of 7,579 feet, and can claim to be the deepest borehole yet made. Probably even this depth could not have been reached by any other method than cable drilling, which is a most unsatisfactory method from an exploratory standpoint. Core-drilling, as is knokn, suffers a great disadvantage owing to the difficulty of maintaining anything like a straight line. If the deviations are unchecked, the rod becomes defected more and more, and might eventually reappear at the surface. If this tendency to deflection is systematically checked, on the other hand, the rod ultimately assumes a corkscrew shape, and the resulting friction absorbs all the energy that can be put into it from the surface. Thus, a core drill seems to be strictly limited in vertical range, and may be dismissed from consideration for any borehole greatly exceeding one mile in depth.

There remains the shaft method, in regard to which experience gained at Morro Velho and in the Rand is highly instructive. The two most fundamental factors in deep shaft sinking are the ventilation of the working and the stability of the rock. With regard to ventilation, it is necessary to keep the air at the bottom of the shaft at a temperature at which men can work continuously for some hourse. An ordinary air current would appear to be unsuitable for this purpose in a very deep shaft, because as the depth increases the air becomes heated by adiabatic compression at a rate which is nearly equal to the temperature gradient in the earth's crust. Other methods of cooling are, of course, practicable; but they all involve an expense which would soon be prohibitive. As to the stablity of the rock at great depths, the little that is known of this factor is by no means encouraging. When an engineer makes a hole in the earth he is constantly in danger of disturbing the balance of forces, which, in the case of rocks under great compressive stress, may become highly dangerous to the stability of the shaft walls. Mr. Marriott gave some graphic illustrations of this effect. In Mysore, where the rocks are highly contorted, and are strained almost to the breaking point, miners are killed or injured by the sudden explosion of the rock, and even in the Rand, where the strata are dipping uniformly, the deep workings are groaning and cracking most unpleasantly. If these things are happening at depths of one mile only, the effect at greater depths maybe expected to be considerable, and Mr. Marriott expressed the opinion that a depth of three miles would be the maximum that could be expected to be reached in any shaft. The 10 or 12 miles contemplated by Sir Charles Parsons, therefore, appears to be quite beyond any possibility of achievement.

The moral of all this is obvious. The exploration of the earth's crust at such great depths being beyond the powers of engineering skill, we should be content for the present with less ambitions schemes. From the point of view of the mining engineer, as well as that of the geologist, it would be highly desirable to put down a number of boreholes of more modest dimensions, rather than to attempt what seems to be practically unattainable, and to undertake which, in any case, would involve a huge capital expenditure.

—"Colliery Guardian."

U. S. BUREAU OF MINES ISSUES BULLETIN OR FLAME-PROOF MOTORS FOR COAL CUTTERS

A proved Explosion-Proof Coal Cutting Equipment is the title of Bulletin 78, just issued by the Bureau of Mines, Department of the Interior. L. C. Ilsley and E. J. Gleim, the authors, say: "Electrical apparatus because of its flexibility and its adaptability to all classes of service has become essential to the mining industry. Hence the problem of providing electrical equipment that is safer for use in explosive mixtures of methane and air is of prime importance in coal mining. Investigators and experiment stations early resognized this fact and much work has been done in the investigation and the development of electrical apparatus for use in atmospheres containing fire damp. The term 'fire damp' as applied throughout this bulletin means an explosive mixture of methane and air.

"Direct current motors and alternating-current motors of the slipring type when running usually give off electric arcs or flashes that will ignite fire damp. Other motors that have no moving electric contacts may become dangerous through accident, deterioration, or neglect. Auxiliary apparatus such as fuses, switches, rheostats, and controllers may arc, flash, or become heated to such a degree that fire damp can be ignited. Such equipment is still more dangerous when worn or out of repair.

"In the United States the development of apparatus for use in gaseous mines has been associated largely with coal-mining equipment run by electricity. This is undoubtedly due to the use of such equipment at the face of the mine workings, where the chance of igniting fire damp is necessarily greatest. One American manufacturer built a coal-mining equipment of the totally inclosed type for use in fire damp atmospheres in 1903. Another built similar equipment with special protective devices in 1906 for export.

"During the years 1910 and 1911, the Bureau of Mines at its Pittsburgh experiment station conducted a preliminary investigation of the safety of such protection as was then in use or under consideration Five motors were submitted for this investigation, each having somewhat different methods of protection.

"Although none of the motors tested met all the conditions for safety, the investigation was of value in lying the foundation for future tests and development. Based on the experience gained a schedule of tests was published by the bureau that stated the fees and requirements for the test of motors designed for use in gaseous mines and also stated that the bureau would give its seal of approval to such motors as met the requirements.

"The first part of the bulletin just issued deals with the general theory of protection from fire damp, gives the bureau's schedule, and shows its application to the testing of commercial apparatus. The second part covers a detailed description of the apparatus that has been tested and, approved under this schdule, together with a résumé of the tests on which the approvals were based."

Copies of this bulletin may be obtained free of charge by addressing the Director of the Bureau of Mines, Washington, D.C.

WORLD PRODUCTION OF COAL IN 1919.

(Prepared by G. F. TRYON, and published by the United States Geological Survey.)

The world's production of coal in 1919 seems to have dropped back to the level of 1910. Preliminary estimates, necessarily, rough, place the total output of all kinds of coal in 1919 at 1,170,000,000 metric tons, or 1,290,000,000 net tons. This is 162,000,000 metric tons less than the production in 1918, the last year of the World War, and about 171,000,000 tons less than that of 1913, the year before the war begun.

This estimate is based by the Geological Survey upon reports to the Supreme Economic Council from countries which contribute about 85 per cent of the world's output. Obviously, returns from the other countries may materially alter this figure, if anything, they will probably reduce it still further.

The following table shows the estimated production of the world for each year from 1910 to 1919. Because of disturbances and interruptions in the compilations of Government statistics, particularly in Central and Eastern Europe, the figures since 1913 are not to be regarded as final. The metric tons of 2,205 pounds is used because it is the prevailing unit in non-English speaking countries. Americans will remember it most easily as being equivalent to the gross ton and the English ton.

The World's Production of Coal, 1910-1919.
(Metric tons of 2,205 pounds.)

Year	Production in part estimated	Per cent produced by United States
1910	1,160,000,000	39.2
1911	1,189,000,000	37.9
1912	1,249,000,000	38.8
1913	1,341,000,000	38.5
1914	1,208,000,000	38.5
1915	1,190,000,000	40.5
1916	1,270,000,000	42.1
1917	1,336,000,000	44.2
1918	1,332,000,000	46.2
1919	1,170,000,000	42.1

Comparative production in five of the belligerent countries before and after the war is shown in the following table:—

Production of Coal in Certain Countries, 1913 & 1919.
(In millions of metric tons.)

	1913	1919
United Kingdom	292	237
France (present boundaries)a	44	22
Belgium	23	18
Germany (present boundaries)b		
Bituminous	173	109
Lignite	87	94
United States	517	494

It is pointed out by the Supreme Economic Council that from 1913 to 1919 the output of bituminous coal in the four European countries shown in the table has failed from 532 millions to 386 millions, the decrease being about 20 per cent in the United Kingdom and Belgium, and nearly 40 per cent in Germany. In the Saar Valley, whose output appears to have fallen from 12 million tons in 1913 to about 8 millions in 1919, the percentage of decrease was over 30. The reduction of the mines in the Nord and Pas de Calais.

The output of lignite in Germany in 1919, though less than in 1918, was still greater than before the war, being 94 million tons, as compared with 87 millions in 1913.

In the break-up of Austria-Hungary the bulk of that country's coal and lignite, the production of which amounted before the war to about 55,000,000 tons, was inherited by the Republic of Czecho-Slovakia was about one-third less than the same territory produced in 1913.

(a) Includes Alsace-Lorraine.
(b) Excludes Alsace-Lorraine and the Saar.

CHANGE IN THE PRESIDENCY OF THE DOMINION STEEL CORPORATION

Roy M. Wolvin has been elected president of the Dominion Steel Corporation, Ltd., Sydney, N. S., to succeed Mark Workman, who resigned the position in order to devote his attention to personal affairs. Mr. Workman, however, has continued as chairman of the board of directors. He will become a member of the London advisory committee of the corporation at the instance of the British interests, who have become associated with it. After a rest at Atlantic City, he will sail for England.

Mr. Wolvin who has risen rapidly to a position of prominence in the industrial world, was born at St. Clair, Mich., Jan. 21, 1880. After a high school education in that city, he commenced his business career as clerk with the Western Transit Co., Duluth in 1896. remaining there about one year. He then became manager of the Great Lakes & St. Lawrence Transportation Co., and the Standard Steamship Co. and occupied these positions from 1901 until 1910. He next became president of the Standard Steamship Co., Winnepeg, Man., the Duluth Shipping Co., Duluth, and the Central Shipping Co., Chicago, in 1910. Later he became president of the Montreal Transportation Co., Ltd., Montreal, Que.; president of the Canada West Coast Navigation Co., Vancouver; vice-president and general managing director of the Halifax Shipyards, Ltd., Halifax, N. S.; president of the Canadian Towing & Wrecking Co., Fort William, Ont.; vice-president, Collingwood Shipping Co., Ltd.,; president, Reid Towing & Wrecking Co., Sarnia, Ont.; president of the Maritime Wrecking & Salvage Co., Halifax, and occupied other important and responsible positions. He was elected a director of the Dominion Steel Corporation in the middle of 1919.

Saward's Annual, 1920.

We are in receipt of the 1920 edition of Mr. F. W. Saward's well-known complication of data on the coal trade of the United States and Canada. Prefaced by a readable review of the coal trade of 1919, the volume contains figures on output, prices, freight rates, transportation, exports and trade conditions generally that are most useful to those who have to deal with the sale or transportation of coal. We would suggest that the value of this compilation might be increased if the coal production of the United States were to be given for each year since the beginnings of the industry. The growth of the industry has been so extraordinary that it is necessary to go back over the annual outputs for at least 25 years in order to get a proper perspective.

The Last Stand of the Reciprocating Steam Engine

By The EDITOR

Readers of a journal devoted to mining interests, particularly those connected with coal production, may, upon first impulse, view the spread of railroad electrification with hostility, or, at any rate, with but mild interest.

The "Canadian Mining Journal" would put forward the suggestion that the fuel problem in Canada is of such a specialized and such an urgent character that every possible means should be adopted to lessen our national handicap and to make Canada self-supplying in light, heat and power.

Canada has excellent waterpowers, but like the coal reserves, they are not evenly distributed. It may be stated (as a generalisation to aid our thinking) that in sedimentary-rock regions of Canada in which the coal reserves are found water-powers are not important, with the possible exception of Vancouver Island. For example, in Nova Scotia, while the waterpowers are not to be despised for local uses, no great outpower of hydro-electric power can be looked for. In the central plains, water-storage for irrigation and town-supply is important, but great waterpowers are absent. In the Archaen Shield, and in the Cordilleran region where coal is not found, waterpowers of great importance occur, and have already been partially utilized for the generation of electricity. It is stated that the undeveloped waterpower of the St. Lawrence River which could be harnessed by the construction of canals totals 4,200,000 h.p. By Combining the electrical power that could be raised from coal in Nova Scotia, with the hydro-electric power possibilities of Quebec and Ontario; and linking these up with the coalfields of the plains and the foothills of the Rockies and the waterpowers of the British Columbian Pacific slope, the possibility of transcontinental railways operated by elcetric power from Sydney to Vancouver is indicated, nor is the idea to be lightly dismissed in the light of what is being accomplished elsewhere.

The April issue of the "General Electric Review" is specially devoted to electric traction, and is a number that deserves the consideration of all who are interested in railways or the coal supply of railways. Under the striking title of "The Last Stand of the Reciprocating Steam Engine," Mr. A. H. Armstrong, contends that the steam locomotive is gradually disappearing from the railway field, as the reciprocating steam engine is disappearing from the industrial field and the propulsion of ships.

The table below given in Mr. Armstrong's paper subdivides the tonnage passed over the tracks of the United States railways in 1918.

The first four items, representing 85.56 per cent of the total ton-miles made during the year 1918 are common to both steam and electric operation.

By introducing the electric locomotive the last four items are reduced to extent of completely eliminating items 6 and 7, reducing item 5 by possibly 80 per cent and item 8 by one-half.

Of the total 14.44 per cent affected, it may be assumed that about 12 per cent of 146,000,000,000 ton-miles at present hauled by steam engines could be totally eliminated with electric locomotive haulage. This ton-mileage equals 20 per cent of items 1 and 2 representing the revenue-producing traffic on the United States railroads.

In other words, if the railways were electrified they could carry one-fifth more revenue-producing freight with no change in present operating expenses of track congestion.

The steam engine-tender would entirely disappear, while the haulage of coal on the railways would be largely curtailed by the use of hydro-electric power, and the establishment of steam power-houses at the coal mines.

Mr. Armstrong remarks that while water-power should be used to the fullest possible economical extent, the greater portion of the power must undoubtedly be supplied by coal, due to the unequal geographical distribution of water power available—so far as the United States is concerned.

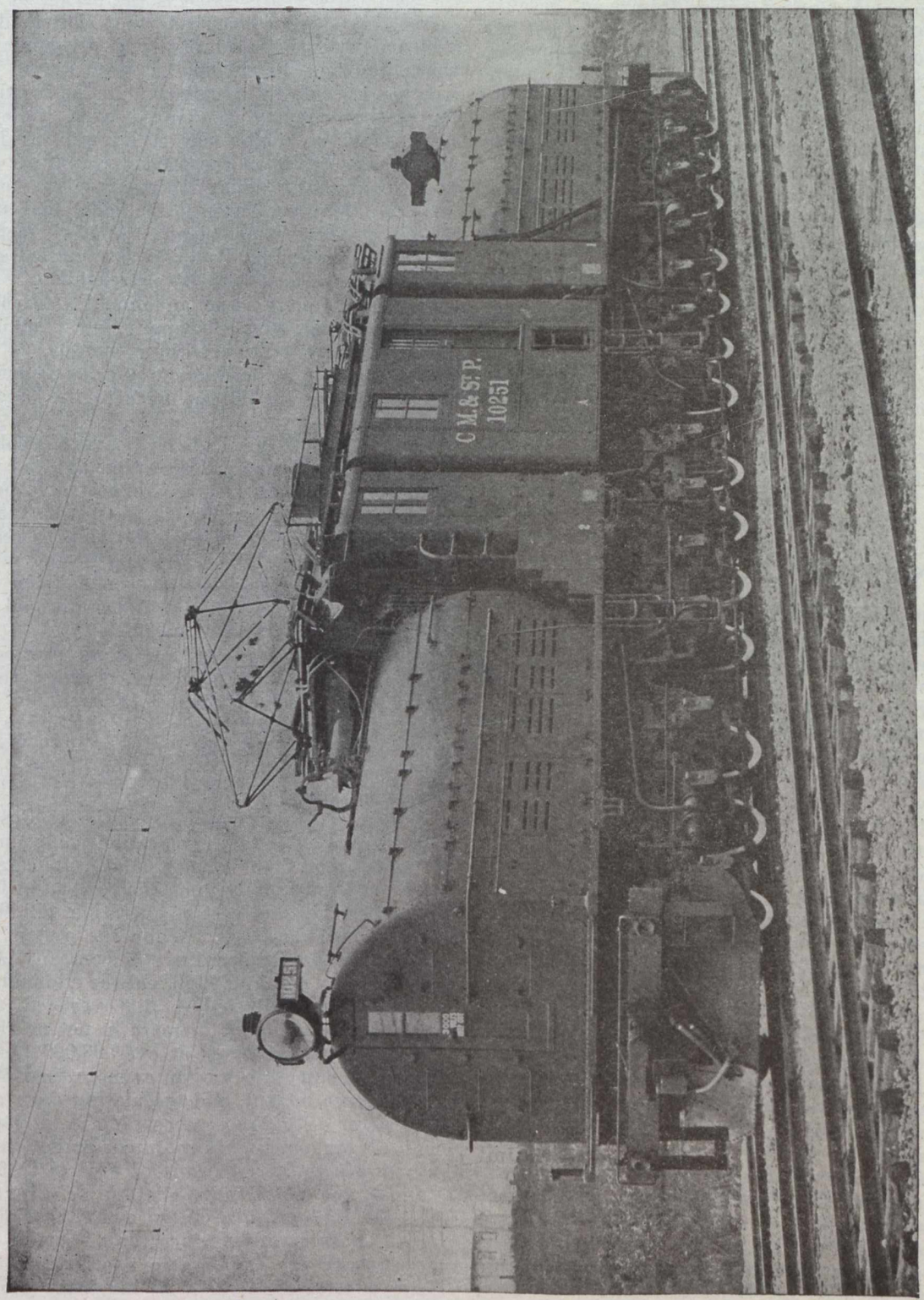
It is exactly this feature which should commend the use of electric locomotives in Canada. The economical distribution radius of coal is much increased when it is used to generate electricity for long-distance transmission, and, as previously suggested in the "Journal" (see issue of Nov. 5th, 1919) the electrification of the Canadian National Railways in the Maritime Privince could be carried out from Sydney to Moncton, N.B. in such a manner as to avoid the necessity of hauling either water or coal for locomotive power purposes throughout the whole of that distance.

Similarly, the establishment of central power-stations with long-distance transmission in the prairie coalfields should enable the radius of western coal usefulness to be enlarged both eastwards and westward.

TOTAL TON-MILE MOVEMENT.

All Railways in United States—Year 1918

	Per Cent	Ton Miles
1—Miscellaneous freight cars and contents	42.3	515,000,000,000
2—Revenue coal cars and contents	16.23	197,000,000,000
3—Locomotive revenue, driver weight only	10.90	132,300,000,000
4—Passenger cars, all classes	16.13	196,000,000,000
Total revenue, freight and passenger	85.56	1,040,300,000,000
5—Railway coal	5.00	60,600,000,000
6—Tenders, all classes	6.50	78,800,000,000
7—Locomotive railway coal	0.39	4,700,000,000
8—Locomotive, non-driving weight	2.55	31,000,000,000
Total non-revenue	14.44	175,100,000,000
GRAND TOTAL (All classes)	100	1,215,400,000,000



The New 3,00-Volt Direct-Current Gearless Passenger Locomotive of the Chicago, Milwaukee & St. Paul Ry.

For mountainous districts the electric locomotive has exceptional advantages, particularly the feature of generation braking by means of which power is returned to the trolley circuit on a down-grade instead of being used up as is the case in the steam locomotive.

The coal operators of Canada are much interested in the cheap production of power from coal, because the greater the value the consumer of coal can get out of his purchase, the larger will be his future purchases. In other words, the cheapening of coal, or its complete utilization, will increase the uses to which it can be put. Just now, the high price of coal is a deterrent to its use, and consumers are scanning every possible substitute. Unfortunately, all indications point to still higher costs for coal production, making it still more necessary to examine every new development that promises more efficient utilization of the power-value of coal.

On the Chicago, Milwaukee & St. Paul Railway, 42 electric locomotives have replaced 112 steam engines, and are hauling a greater tonnage with reserve capacity for still more.

From the results obtained on this read, Mr. Armstrong estimates that had the railroads of the United States been electrified in 1918 approximately 122,-500,000 tons of coal, or more than two-thirds the coal now burned in 63,000 locomotives could have been saved.

Northern Ontario Letter

THE SILVER MINES.

During the month of April the quotations for silver averaged approximately $1.20 an ounce. At the beginning of the month, it was quoted at $1.26½, and at the close of the month was quoted at $1.14½. During the month the lowest point reached was $1.12 an ounce. The April average, therefore, was well above the price for the whole of 1919 when an average of $1.11 1/8 was established, and compares with 96.77 cents in 1918 and a low average of 49.69 cents in 1915.

Metal authorities, as well as the silver producers of Cobalt in making a careful observation of the situation with the object in view of ascertaining the influences which have recently caused more or less violent fluctuations, seem still to have arrived at no uniform opinion. Among the advices received from abroad, and which would tend to throw some light on the situation, is the declaration that Great Britain is discouraging the mania for silver in India, and that the Chinese are less aggressive as bidders, not for the reason that they do not want the metal but due to the balance of trade operating against them. Also, that another large amount was not long ago released from the United States Treasury.

While influences such as the above may stem the tide of rising quotations, and, in fact, may cause violent fluctuations with a lowering tendency, yet those vitally concerned with the producing mines appear to cling unalterably to their opinion that the law of supply and demand must inevitable ultimately hold sway and that higher prices seem to lie in the future. As to this, time will contain the verdict.

The large surplus accumulated by the Nipissing Mining Company has been the subject of considerable comment and also criticism, according to the Toronto and London newspapers. The view is expressed that the shareholders are entitled to large dividend returns under the circumstances, and that the company is needlessly holding government war bonds. The matter has been received with deep concern in Northern Ontario where the policy of the Nipissing Mining Company is held up as an example of what all real mining companies should be. It is pointed out that during the past three years which is the period in which the increase in surplus occurred, the shareholders have been paid 30 per cent annually in dividends, and that the increase in the surplus has been placed largely in war bonds (chiefly Canadian). In the North, the policy of the company is admired; and, while the company could no doubt market its war bonds without any serious effect on the market, yet if all companies adopted a similar policy the result might become serious, and, therefore, leads to the belief that such would be quite wrong in principal. Another factor is that the Nipissing Mining Company is regarded as a leader in its fair dealings with its shareholders. Not only does the company issue an annual statement that would do credit to any company, but a financial statement is presented every three months, as well as a monthly report of production and developments exactly as reported by the manager to the president and directors.

At the 1,400-ft. level of the Beaver-Consolidated the four-inch vein opened up some time ago and which contains some high grade ore, is expected to be the forerunner of interesting developments on that part of the property. Also, in that the vein passes onto the adjoining Prince claim which the Beaver now has under lease on the basis of an even division of the net profits, the prospects of finding additional veins and ore on the Prince are favorable.

The McKinley-Darragh has again pressed its oil flotation equipment into service, after leaving the plant closed since January when cold weather interfered with pumping operations. Production will accordingly be increased to the extent of the silver recovery from the re-treatment of from 175 to 200 tons of sand and slimes daily.

In view of the intimation that the La Rose will curtail to some extent its exploration policy, particularly in fields other than Cobalt tends to indicate that with work centered largely upon the companies four Cobalt properties the total cost of operation will this year be reduced considerably. While the cost of labor and expense as that incurred by the company last year on material may continue high, yet the elimination of such prospect work will reduce the overhead, and should cause a corresponding increase in net profits.

Figuring ore reserves at over 23,000 tons and containing 22 ounces to the ton or more than 500,000 ounces of silver insight, and calculating costs at $8 a ton with silver at $1.25 an ounce. Mr. A. J. Young, president of the newly incorporated Bailey Silver Mines estimates a daily net profit of $768.75 from the operation of the old Bailey-Cobalt Mine. In addition to this, the Bailey Silver Mines owns the Northern Customs Concentrator on which the net profit from treating customs ore amounts to about $250 daily. This makes a total of $1.018.75 as indicated daily net profits, as against an authorized capital of $1,250,000, divided into 1,250,000 shares of the par value of $1 each. Following is an interesting extract from the report, and which shows the added possibilities of the future of the mine:—

"The engineers' report show that ore actually developed amounts to 23,126 tons, with an average assay

value of 22 ounces of silver per ton, containing 510,-294 ounces of silver. The report does not include any ore which may be stoped to a greater width than six feet, nor any values for the higher grade veins, several of which may be seen in the mine. It also does not include the ore on the dump, which amounts to several thousand tons, and which has considerable commercial value; neither does it include any probable ore which may be found by the development of the unprospected areas where there are a number of known veins."

Information has just been received that the interests now in control of the old Keeley mine in South Lorrain have acquired an option on the adjoining Beaver Lake property and have made the second payment on the option. The plan of operation on the Keeley includes the continuation of the shaft from its present depth of 230 feet to the contact which is estimated to lie at a depth of between 350 to 400 feet. At or near the contact the main veins will be explored, the largest of which passes from the Keeley onto the Beaver Lake property. Work is now proceeding at a satisfactory rate at the Keeley.

Senator Sharp, of Ottawa, paid a recent visit to the Leroy Lake section of the Gowganda district for the purpose of looking over the Silver Bullion and Dodds properties which were recently merged. Senator Sharp declared himself as being favorably impressed with the properties.

After having toured the United States with the purpose of gathering ideas in connection with ore testing laboratories with a view to erecting one in British Columbia, Charles Kamsell of the Geological Survey in B. C. and William Timm, head of the Ore Dressing Laboratory at Ottawa, paid a visit to the Haileybury Mining School. It is understood the modern plant in operation in the Haileybury School left a favorable impression.

During the week ended April 30th, six Cobalt companies shipped an aggregate of nine cars containing close to three quarters of a million pounds of ore, the output being the highest record for any previous month during the current year. The Mining Corporation with three cars containing close to a quarter of a million pounds was the heaviest shipper.

Following is a summary:—

Shipper	Cars	Pounds
Mining Corp.	3	240,277
McKinley-Darragh	2	189,188
Coniagas	1	88,000
O'Brien	1	77,673
Hudson Bay	1	61,522
Peterson Lake	1	60,000
Totals	9	716,660

During the corresponding period the Mining Corporation was the only bullion shipper, sending out 50 bars containing 50,783.50 ounces. The Nipissing, the leading producer, continues to store its output.

THE GOLD MINES.

Opinion is divided on the question of placing a tax on gold used in the arts and in return paying a bonus to the gold mines. The plan being advocated in the United States whereby the arts would be taxed $10 extra for each ounce of gold used, would presumably constitute a fund from which the producing mines could be paid a bounty on each ounce of gold produced. Some of the operators believe the scheme should be carried out, while others fear that it might only serve to create offices for another small army of men and with an overhead expense that might leave no very material amount available for bonus payment to the mines.

It is announced that the annual meeting of the shareholders of the Porcupine V.N.T. Mines will be held in Toronto on May 27th, at which time the usual routine of business will be done, as well as a discussion and consideration of suggestions which the shareholders have to make with regard to the affairs of the company. In view of the improved conditions in regard to the supply of labor, and that the Porcupine V.N.T. is equipped with a mill with a capacity of 100 tons daily, and with a large tonnage of ore immediately available, it is thought that some decision may be reached with regards to resuming work.

At the Dome Mines the indications are that full capacity may be shortly attained, and in which case the net profits may be expected to increase. There is considerable speculation as to the probable contents of the coming annual report covering the twelve months ended March 31st. It is thought that the report will be divided into two periods, that prior to the date of re-opening the mill and that covering the productive period. In this way it will be possible to arrive at a more accurate idea of the performance to be expected during the current year. More men are becoming available, and this is stated to be making it possible to prosecute with increasing vigor the work of exploring the Dome Extension property at the lower level. The question of exercising the opinion held on the property before October, next, will depend upon the result of this exploration work.

Results at the Hollinger, McIntyre and Porcupine Crown continue comparatively uniform, with a tendency toward improved production, and with a fairly satisfactory increase in the supply of labor.

The annual report of the Sovereign Porcupine Mines Company shows an expenditure of $16 872.43 during the year 1919 on exploration and development work. During the period approximately 4000 feet of diamond drilling was done. In doing surface work on the southern part of the property "an excellent vein, heavily mineralized, was uncovered". This vein was stripped for about 45 feet in length.

In the Kirkland Lake field the arrival of spring has been marked by further increase in activity. At a meeting of the shareholders of the Hunton-Kirkland, held in Haileybury on April 29th, it was decided to commence operations at once on the property, a satisfactory deal having been arranged with United States interests. Machinery for a mining plant is already being placed on order. Details will appear in next week's issue of the Journal.

Since resuming work very recently, the Wright-Hargreaves Company has added about fifty men to its pay-roll. The underground workings have been dewatered and machines are now in operation. The construction of the mill is also to be carried forward as fast as the supply of labor will permit, and the mine is expected to join the list of important gold producers before the end of this summer.

At the Kirkland Lake mine of the Beaver Company, it has been decided to continue the main shaft from its present depth of 700 feet to a depth of 900 feet, work toward this end having already commenced. It is also stated that an excellent shoot of high grade ore has been opened up in a stope from the 300-foot level.

The plan of development includes the driving of a log development drift at the 500 foot level to the west boundary of the property.

On the Lake Shore, production continues normal at approximately $1,500 daily and with mill heads ranging from $23 to $25 a ton. The mill is treating a little over 50 tons of ore daily.

The main shaft on the Ontario-Kirkland has reached the 450-ft. level and the work of cutting a station will be carried out. It is proposed to cross-cut both north and south so as to intersect and drift along the veins which were developed at the 300-ft. level so as to determine the extent of the downward continuation of the ore shoots. Plans have been made with R. C. Coffey to design and supervise the construction of a mill, but actual work will be held in abeyance pending the result of work at the 450-ft. level.

Boston Creek and Skead township interests have combined toward providing a road to Skead by way of Boston Creek, instead of following the present road from Englehart. The distance from Englehart is about 24 miles, while from Boston Creek it ranges from eight to twelve miles. The appeal for government assistance having failed, the prospectors and claimholders have joined together and already have cleared and fairly satisfactory trail, and have built a foot bridge over the Blanche River. It is stated that if the government will build a bridge suitable for vehicle traffic, the prospectors and mining men will provide a right of way for wagon traffic from the railway to the center of activiey. The present band of amateur road-builders have been self-named the "Boston Creek and Skead Township Overalls' Brigade." At any rate, they have exhibited a degree of enthusiasm that bids fair to have some effect on the government.

One the Miller Independence Mines at Boston Creek, although the crosscut at the 500-ft. level has not yet reached the point where the downward continuation of the main ore body is expected to be encountered, yet a narrow vein has been found in which gold tellurides occur. This is pointed to as an excellent indication that the crosscut may intersect the main vein at a mineralized horizon.

In the Sesekinika Lake district, in the township of Maisonville, the Golden Summit Mining Company has completed the purchase of the Jensen Farm, the price paid being $10,000 in cash and small block of stock. Two veins occur on the property, both of which are very narrow at surface, but one of which widens out to about two feet in width at a depth of eighteen feet. The formation is andesite, with intrusions of porphyry. A limited amount of surface exploration is being carried on, and a special car with visitors from Detroit will arrive on the ground about May 13th.

A meeting of the shareholders of the Thompson-Krist Mining Company will be held in Toronto on May 10th for the purpose of considering and if approved ratifying the deal which is to merge the company's property with that of the Porcupine Crown. A new company is being incorporated, to be known as the Northcrown Mining Company, with an authorized capital of $3,000,000, divided into 3,000,000 shares of par value of $1 each. The Porcupine Crown will pay into the treasury $20,000 and receive in return 1,999,997 shares; while the Thompson-Krist will pay $10,000 into the treasury and receive 999,997 shares.

Contracts were left on April 30th for the sinking of a shaft on the Fidelity property in Teck township from 150 to 300 feet, and for 2,000 feet of lateral work at the 300-ft. level. The work is already underway. This company is also planning to let a contract for a large amount of drilling on its properties in Skead township on which large sulphide dykes occur.

British Columbia Letter

Victoria, V. C.

Stewart, B. C.: The Benson Brothers, of Victoria, B. C. who staked in the Salmon River District, Portland Canal, before the war from which they have just returned, have sold a two-third interest in their properties to a Vancouver syndicate of business men for a substantial amount. There are two groups of claims involved, one known as the white Mouse being situated on the Canadian side of the line and the other group, which has been given no special collective designation, consisting of fifteen claims located on the American side. The Bensons assert that while no considerable development has been done they uncovered a lead containing native silver and that assays gave first class returns.

George Clothier, government mining engineer, discussing conditions in northern British Columbia recently made it clear that, although there is much excitement over mining prospects in this section and notwithstanding that this sentiment appears to be justified to a large extent, there are as yet only three proven mines of note. These were the Dolly Varden, at Alice Arm, the Engineer, in the Atlin District, and the Premier of Salmon Arm. But these were great properties. He continued: "The Engineer, at Carcross, is a proven gold mine and will operate this year if the will of the late Capt. Alexander, who was the owner, is executed. Shipments from this mine would be made by water to the White Pass Railroad where ore would be taken by rail to Skagway and thence south to the smelters. This Mine will have the same effect in making Atlin an active town as the Premier and the Dolly Varden have on Stewart and Alice Arm. In the Stewart and Alice Arm Districts there are many properties under development and many of them show great promise. Nothing more however, can be said of these until they are proven. A mining country cannot be made in a single year and we will know more about the country a year from now. Vancouver and Victoria are full of companies, many of which are formed over properties on which no development work has been done. Some such companies no doubt will fall through because of lack of funds to carry out development work. In every mining country there are a flock of these. It is hard for good companies to get properties on account of the prices asked for by prospectors. Big companies are always willing to put their money in the ground but they do not like to have to pay and spend it on the chance of proving up a good thing."

Stewart and Hyder, situated at the head of Portland Canal and the Canadian and American portals to the Salmon River mining district, are very busy little towns according to advices from the north. Miners, prospectors, speculators and many others whose business it is not easy to define are being taken into the camps in boat-loads, every north-bound vessel from

either Vancouver or Seattle being crowded. Real- estate values in both communities are said to have soared, having practically doubled in the course of the last six months. It is reported that the Provincial Government intends placing some of the lots of the Stewart townsite, which reverted to the Crown, on the market. Mining machinery is being taken in over the trail to both the Premier and properties of the Angelican (Belgian) Mines, as well as to some prospects on which development is underway, and the whole trend of travel, at least on the part of those who are entering the country for earnest work this season, is up the Salmon or the Bear Rivers. In Hyder there is a building boom. The tide flat area is being improved, foundations being laid over it for buildings which are in course of construction or which are planned. A sidewalk 1,900 feet long is being laid to connect up these structures.

With reference to development work on the Spider Group, under bond to the Algunican Development Co., of Belgium, and which is situated on the Salmon River District, it is interesting to note that camp supplies, as well as mining machinery including a compressor, have been freighted over the snow. To accomplish this horses were fitted with snow-shoes of a special design which are reported to have served admirably.

There is much talk over the prospects of the Marmot River Section of the Bear River zone, Portland Canal. Mr. George Clothier, government mining engineer, reported on a number of prospects in this locality last year and on the whole his observations were favorable. It is said that there are a number of properties with showing of ore high in silver. This season there is no doubt that much prospecting will take place here as well as throughout the Bear River Valley, while development is planned on a number of claims. C. B. Bush and associates and the Sterling Mining Company are among those interested in the development of properties in this zone.

..The Silver Group, Salmon River, consisting of three claims and situated about 21 miles from Hyder, has been bonded by R. H. Stewart, mining engineer of Vancouver, B. C., and associates in the sum, it is unofficially reported, of $77,500 and $5,000 has been advanced as an earnest of the intention of the bondees to proceed with development this year.

Alice Arm, B. C.: The Dolly Varden Mine will continue at least for the present under the ownership of the Taylor Mining Co., subsidiary to the Taylor Engineering Co. This property and its affairs occupied the limelight to a considerable extent during the closing days of the Provincial Legislature. R. T. Elliott, solicitor for the original holders of the property, the Dolly Varden Mines Co., telegraphed Premier Oliver accusing him of all evil doing in this connection. The opening paragraph of Mr. Elliott's first telegram, for there were two, is a good specimen. "The influence brought to bear" he said" upon the Oliver Government in attempts to secure further legislation affecting property rights in Dolly Varden mines constitute direct lobbying for fraudulent purposes, being wilful attempts to substitute forces of secret illicit lobbying for open public administration." The premier read this to the House, defended the course that the Legislature had taken with reference to the property and introduced a Bill confirming the Taylor Engineering Company in its title to the mine, the mine plant, the railway, etc., in short of all the holdings embraced in the property commonly termed the Dolloy Varden Mine. This passed the legislature without division and now is a part of the British Columbia Statutes. This legislation is expected to strengthen the position of the Taylor Engineering Company with the question of ownership comes before the Court, where it is being taken by Mr. Elliott on behalf of the original Dolly Varden Company.

Development on the La Rose Claims, Alice Arm, is reported to have opened up a strong lead of high grade ore. That some mine machinery is to be installed to facilitate work, that a 450 foot crosscut is to be driven and that some diamond drilling is propsed is the effect of an announcement from the company's headquarters, Vancouver, B. C.

A twol-drill compressor and power plant is to be installed on the North Star Property states P. Oleson, who is in charge of development work. The machinery is being obtained from San Francisco.

Anyox, B. C.: One of the diamond drilling outfits which has been in use by the Granby Consolidated Mining & Smelting Co., on Ecstall River properties is to be sent into the Salmon River section for work to be undertaken this summer.

O. B. Smith, connected with the Granby Consolidated Mining & Smelting Co., for the past twenty-one years, has resigned. At the time of his retirement, which was forced because of ill-health, he was assistant to the managing director and head of the exploration department of the Company. Mr. Smith graduated from the Messachutts Institute of Technology in 1897. From 1899 to 1904 he was engineer for the Granby properties at Phoenix, B.C. and from 1904 to 1908 he was superintendent at the same place, following which date he was general superintendent of mines for the company in all the districts in which it operated.

Douglas Channel, northern B. C. Coast.

The Drum Lummon Mine is reported by C. L. Copp, Superintendent, to be showing up satisfactorily on development. Mr. Copp, who is about to take north some special parts for the Mill, which is to be ready for an early start this season, states that the tunnel is in high grade milling ore and that a large tonnage has been taken out during the winter and is ready for treatment.

Barkerville, B. C.

Pickeringite, a hydrous sulphate of magnesium and aluminum, which has not been observed previously in British Columbia, has been found in the Cariboo Country. Samples have been brought out by W. H. Brock and analysed by Dr. V. Dolmage, of the Geological Survey. The mineral, which is of a creamy color, with a silky lustre, was found in considerable quantities but it is not thought that the deposit goes far beneath the surface. The mineral has been observed in Chili, Argentine, Colorado, and Nova Scotia.

Sheep Creek, B. C.

Harold Lakes, Superintendent of the Nugget Gold Mines Ltd., reports that the old Motherlode Mill is ready to commence the season's work as soon as a shipment of cyanide, now on order, arrives. Recently efforts at the mine have been concentrated on the laying of track, the construction of chutes, and otherwise preparing for production. Mr. Lakes reports that the drift on the main vein at a depth of 625 feet has developed the ore for a total distance of nearly 200 feet. Drifts driven both to east and west still are in ore, the vein widening and narrowing with the advance but, it is said, the values are maintained. At the recent annual meeting of the Company an encouraging report was submitted by R. H. Stewart, consulting engineer. Officers were elected as follows: President, A. C. Burdick; secretary, G. S. Bothwell; directors, Captain W. H. Logan, E. H. Beasley, R. S. Lennie, K. C., and Professor J. M. Turnbull.

Nelson, B. C.

A full crew of men is employed on the Texas-Yankee Girl Mine, near Ymir B. C., getting it in shape for production. The power plant is being repaired and soon will be ready for operation and it is the intention of the new owners to proceed with a systematic plan of development.

Riondell, B. C.

Water conditions in most sections of the Kootenays having improved many of the Mills, which were closed down for some weeks, either have resumed operations or are preparing to do so. The Blue Bell Mine at Riondel is one of those planning to again become an active producer. As soon as a crew of men can be obtained the development work underway will be continued and the Mill will be re-opened.

Ainsworth, B. C.

The property of the Florence Silver Mining Company, Princess Creek, is being re-opened. The Mill again is active after a period of some weeks idleness caused by lack of water.

The Utica Mines Ltd. will operate its property, Paddy's Peak, after the 1st of June. It will be recalled that A. J. Poyntz and associates obtained a lease of a portion of the workings where they developed some high grade ore. Their interest lapses on the date named.

Greenwood, B. C.

The Waterloo Property, Lightning Peak, is reported to be showing up well on development, a good sized body of high grade silver bearing ore having been struck on the second level. On the Kootenay property a tunnel is being driven which now is in 36 feet.

Slocan, B. C.

A serious tie-up of mining operations in the Slocan District, B. C., is threatened, officials of the One Big Union, which is said to be at least well enough organizer among the metalliferous mine workers of the section to be able to cause trouble, having given the Mine Operators notice that on and after the 1st of May the miners must have a substantial increase of wages. The present scale is $5.50 for miners and $5 for muckers with 50 cents extra in each case of wet mines. The demand, generally speaking, is for an extra $1 a day and, it is asserted, the men also want the employers to supply them with blankets and white sheets.

As the Mine Operators are understood to have refused to consider acquiescence it is likely that the O. B.U. will be permitted to carry out the threat behind the ultimatum. The issue, however, still is in doubt as arrangements are being made for a meeting of the representatives of both sides to take place on the 30th of April.

If there is a strike quite a number of active silver-lead producers would be closed down. Among the properties of the Slocan Mining Division that have shipped 1,000 tons of ore or more this year, and whose operations would be interfered with, are the Bosun, Galena, Rambler-Cariboo, Silversmith, Standard, and six of the Clarence Cunningham mines, viz., Ivanhoe, Sovereign, Hewitt, Queen Bess, Van Roi, and Wonderful. From this Division, and from the Slocan City Division, there have been shipped this year upwards of 140,000 tons of good grade ore and there are employed below ground 417 men and above 206 men.

As is it likely that the Ainsworth Mining Division, which is adjacent and no doubt is included in the scope of the O. B. U. demands, it is interesting to note that the Florence and the Cork-Province Mines would be affected and that throughout that section, according to late returns, there are employed 127 men below ground and 95 men above.

Trail, B. C.

Receipts at the Trail Smelter of the Consolidated Mining and Smelting Co. for the week ending April 14th totalled 4,408 tons, of which 48 tons were concentrates. This brings the aggregate for the year up to 82,232 tons, of which 78,874 tons was ore and 3,358 tons concentrates. There are two new shippers, namely, the Last Chance, of Sandon, and the old St. Eugene, of Moyie.

On the 15th of April 1920 the Consolidated Mining and Smelting Co. of Canada, operating the Trail Smelting and Refining Plant as well as a number of large and small producing mines in British Columbia, took out a blanket insurance policy covering the lives of its employees and protecting their families or dependents against their permanent disability. Roughly the Company employs 2,000 men. The amount of insurance is based on length of service. One who has been employed for five years and six months and over has a policy in his favor of $1,500 while one working for six months and less than one year has been insured for $500. Those ranking between the maximum and the minimum have policies the amount of which are based on a graduated scale which, of course, mounts as length of service increases.

In announcing this innovation the Company, among other statements, makes the following: "On leaving the service of the company the insurance ceases"; "In the event of re-employment a man is classed as a new employee". In the case of permanent or total disability before the age of sixty years the amount of the insurance will be paid in one sum or over a period of years; "There is no cost to you and no medical examination is required; "It does not in any manner take the place of or interfere with the benefits provided by the Workmen's Compensation Act or any other insurance the employee may have; and "This

action is voluntary on the part of the Company and constitutes no contract with any employee and confers no legal rights on him."

Greenwood, B. C.

The Silver Cloud and Skylark properties in the Greenwood Mining Division are being developed with promise of good results. On the former a nine foot lead is receiving attention the ore giving good results in gold and silver. The operators are considering the installation of a small concentrator. Some years ago the Skylark was a considerable producer and it is claimed that the old lead has been discovered.

Comox, B. C.

The Providential Mining Co. is reported to be developing a copper property in the Buttles Lake District, Vancouver Island, having been working all winter and now being engaged in taking in a diamond drill and other machinery to continue development on a more comprehensive scale. It is said that about $10,000 already has been invested.

Victoria, B. C.

Among the mining companies to be incorporated in British Columbia recently are the Northwest Silver Mining and Development Co. Ltd., with a capitalization of $1,000,000 with headquarters at Vancouver B. C. and the McLennan Silver Mines Ltd., with a capitalization of $1,500,000, headquarters Vancouver B. C.

Nova Scotia Notes

The Mabou Areas

The Montreal "Star" seems to attach much importance to the Mabou areas, which a recent dispatch described "as the last large independent mining area in Cape Breton." This despatch says the mine "has not been worked for several years since American interests were forced to let go their holdings through a Wall Street Panic." The Mabou Colliery was flooded by an inbreak from the sea in 1909, and it has usually been presumed that this was the reason for its abondonment. Residents in Inverness County will be best able to appreciate the accuracy of the "Star's" frequent news items regarding Mabou, and will also be able to form conclusions as to the disinterestedness of an announcement which intimates that Scotia and Dominion Steel are dickering for the Mabou area with a view to bettering their positions in prospect of the expected amalgamation of interests. The Mabou area is actually one of quite limited extent, and in its operation some difficult questions of extraction and transportation will have to be faced, and its acquisition would not materially strengthen either Dominion or Scotia, both of which companies possess areas much more adapted to their requirements.

MACHINERY FOR SALE.

One 50 H.P. Wood Burning Boiler, 14 feet long, 4 feet in diameter, with fifty, three inch flues.

One Canadian Ingersoll-Rand Compressor, size 12 inches by 18 inches, speed 140 revolutions per minute, air capacity, 320 cubic feet per minute.

One Blaisdell Compressor, belt driven, size 12 inches by 14 inches, speed 225 revolutions per minute, with an air capacity of 450 cubic feet per miute.

Two air cooled, Canadian General Electric Transformers, capacity 100 k.w., Type A.B., 60 cycle, 4000 volts Sec. 575.

Address:—
BLACK DONALD GRAPHITE CO., LTD.
Calabogie, Ontario.

FOR SALE.—Prospectors' Magnetic Dip Needle. Ring Handle, 4 inches diameter overall. Almost new. $10.00

Box 13, CANADIAN MINING JOURNAL,
Toronto.

Second Hand Steam Hoists

We have for Sale Two Cable Hoists, description as follows:—

One 14 in. x 24 in. simple twin reversing link motion horizontal engine connected by gears to a double drum twin hoist. Drums 100 in. dia. by 60 in. face. Lagging on drums 9 in. oak blocks bolted to drums. Driving pinion 32 in. dia. by 8 in. face. Driving gear, 12 in. dia. by 8 in. face. Drum shaft, 7 in. dia. in bearings. Bearings, 3-7 in. cast-iron babbitted. Brake band on both drums.

One 8 in. x 16 in. simple twin reversing link motion horizontal engine connected by gears to a single drum hoist, endless cable type, with the necessary gears, shieves and idler shieves and cable tightening device for taking up slack by means of idlers. Brake band in drum.

These hoists are in A-1 condition, and as part of a plant in liquidation, must be sold.

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MACGOVERN & COMPANY INCORPORATED POWER MACHINERY

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3 Phase, 60 Cycle, 2200 Volts

GENERATOR			ENGINE	
K.W.	Make	RPM	Cycl. Dimensions	Make
18½	Emberg Elec.	360	7 x 8	Emberg Elec.
30KVA	Westinghouse	1200	12 x 16	Muncie
40	Ridgway	—	2 Cylinder	Bruce McBeth
50KVA	Westinghouse	300	10 x 12	Skinner
50	Bullock	1200	11 x 12	Skinner
50	Fort Wayne	300	12 x 13	Rathburn
59	Western Elec.	276	9 x 14	Robb Armstrong
60	Fairbanks Morse	1200	—	Fairbanks Morse
75	General Elec.	—	—	Ideal
100	General Elec.	257	14 x 14	Lycoming
100	Crocker Wheeler	277	14 x 14	Harrisburg-Fleming
100	General Elec.	257	14 x 14	Lycoming
110	Warren	720	13 x 18	Erie City
117.5KVA	—	257	3 Cylinder	Can Producer & Gas Engine Co.
120	General Elec.	225	16 x 18	Erie Ball
150	General Elec.	600	—	Chandler Taylor
			20 x 18	Fleming Harrisburg
165KVA	Westinghouse	225		
175KVA	Western Elec.	225	21¼ x 22″	Sheffield
185KVA	General Elec.	225	17 x 21	Erie City
200	Westinghouse	600	20 x 42	Corliss
240	General Elec.	200	14 x 30	Harrisburg-Fleming
250	General Elec.	200	15 x 29 x 22	Harrisburg
325	Can. Gen. Elec.	150	18 x 36 x 24	—
360	General Elec.	150	15 x 28 x 30	Harris
400	General Elec.	120	20 x 40 x 42	MacIntorh & Seymour
400	Westinghouse	107	18 x 32 x 42	Rice & Sargeant
600	Can. Gen. Elec.	150	20 x 38 x 24	Laurie & Lamb
675	General Elec.	100	20 x 38 x 42	MacIntosh & Seymour
600	A. C. Bergman	—	23 x 40 x 30	Goldie & McCulloch
750	General Elec.	164	25 x 42 x 30	Lentz
750	General Elec.	164	25 x 42 x 30	Erie City
800	General Elec.	100	24 x 48 x 48	MacIntosh & Seymour
1000	General Elec.	120	26 x 54 x 48	MacIntosh & Seymour
1050	General Elec.	100	24 x 48 x 48	MacIntosh Seymour

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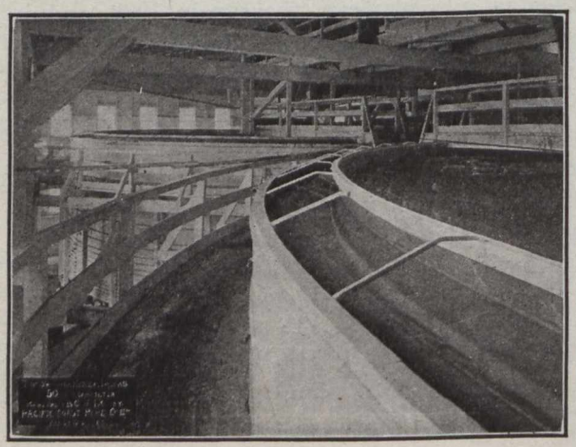

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The Canadian Miners' Buying Directory.

Acetylene Gas:
Canada Carbide Company, Ltd.
Canadian Fairbanks-Morse.
Prest-O-Lite Co. of Canada, Ltd.

A.C. Units:
MacGovern & Co.

Agitators:
The Dorr Co.

Air Hoists:
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited.

Alloy and Carbon Tool Steel:
H. A. Drury Co., Ltd.
International High Speed Steel Co., Rockaway, N.J.

Alternators:
MacGovern & Co.

Spielman Agencies, Regd.

Aluminium:

Amalgamators:
Northern Canada Supply Co.
Mine and Smelter Supply Co.
Wabi Iron Works.

Antimony:
Canada Metal Co.

Antimonial Lead:
Pennsylvania Smelting Co.

Arrester, Locomotive Spark:
Hendrick Manufacturing Co.

Arsenic White Lead:
Coniagas Reduction Co.

Assayers' and Chemists' Supplies:
Dominion Engineering & Inspe tion Co
Lymans, Limited
Mine & Smelter Supply Co.
Pennsylvania Smelting Co.
Stanley, W. F. & Co., Ltd.

Ash Conveyors:
Canadian Link-Belt Company

Ashes Handling Machinery:
Canadian Mead-Morrison Co., Limited

Assayers and Chemists:
Milton L. Hersey Co., Ltd.
Campbell & Deyell
Ledoux & Co.
Thos. Heys & Son
C. L. Constant Co.

Asbestos:
Everitt & Co.

Balls:
Canadian Foundries and Forgings, Ltd.
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works.
The Hardinge Conical Mill Co.

Ball Mills:
Hardinge Conical Mill Co.
Hull Iron & Steel Foundries, Ltd.
Mine and Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works.

Balances—Heusser:
Canadian Fairbanks-Morse Co., Ltd.
Mine and Smelter Supply Co.

Babbit Metals:
Canada Metal Co.
Canadian Fairbanks-Morse Co., Ltd.
Hoyt Metal Co.

Ball Mill Feeders:
Fraser & Chalmers of Canada, Ltd.
Hardinge Conical Mill Co.
Hull Iron & Steel Foundries, Ltd.

Ball Mill Linings:
Hardinge Conical Mill Co.
Hull Iron & Steel Foundries, Ltd.

Belting—Leather, Rubber and Cotton:
Canadian Fairbanks-Morse Co., Ltd.
Link Belt Co.
The Mine & Smelter Supply Co.
Northern Canada Supply Co.
Jones & Glasco.

Belting:
R. T. Gilman & Co.

Belting (Transmission):
Goodyear Tire & Rubber Co.

Belting (Elevator):
Goodyear Tire & Rubber Co.

Belting (Conveyor):

Goodyear Tire & Rubber Co.

Blasting Batteries and Supplies:

Canadian Ingersoll-Rand Co., Ltd
Mussens, Ltd.
Northern Canada Supply Co.
Canadian Explosives, Ltd.
Giant Powder Co. of Canada, Ltd.

Bluestone:

The Consolidated Mining & Smelting Co.

Blowers:
Canadian Fairbanks-Morse Co., Ltd.
MacGovern & Co., Inc.
Northern Canada Supply Co.
Fraser & Chalmers of Canada, Ltd.

Boilers:
Northern Canada Supply Co.
Canadian Ingersoll-Rand Co., Ltd.
Marsh Engineering Works
MacGovern & Co., Inc.
R. T. Gilman & Co.
Fraser & Chalmers of Canada, Ltd.
The John Inglis Company
Wabi Iron Works.

Blue Vitriol (Coniagas Red):
Canadian Fairbanks-Morse Co., Ltd.

Bortz and Carbons:
Diamond Drill Carbon Co.

Boxes, Cable Junction:
Standard Underground Cable Co. of Canada, Ltd.
Northern Electric Co., Ltd.

Brazilian Rough Diamonds:
Diamond Drill Carbon Co.

Brazilian Mica:
Diamond Drill Carbon Co.

Buggies, Mine Car (Steel)
Hendrick Manufacturing Co.

Brazilian Ballas:
Diamond Drill Carbon Co.

Brazilian Rock Crystal:
Diamond Drill Carbon Co.

Brazilian Tourmalines:
Diamond Drill Carbon Co.

Brazilian Aquamarines:
Diamond Drill Carbon Co.

Bridges—Man Trolley and Rope Operated—Material Handling:
Canadian Mead-Morrison Co., Limited

Bronze, Manganese, Perforated and Plain:
Hendrick Manufacturing Co.

Buckets:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Mead-Morrison Co., Limited
The Electric Steel & Metals Co.
R. T. Gilman & Co.
Hendrick Manufacturing Co.
Link-Belt Co.
Marsh Engineering Works
Mussens, Ltd.
MacKinnon Steel Co., Ltd.
Northern Canada Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works.

Buckets, Elevator:
Hendrick Mfg. Co.

Cable—Aerial and Underground:
Northern Canada Supply Co.
Standard Underground Cable Co. of Canada, Ltd.

Cableways:
Canadian Mead-Morrison Co., Limited
Fraser & Chalmers of Canada, Ltd.
Mussens, Ltd.
The Wabi Iron Works
R. T. Gilman & Co.

Cages:
Canadian Ingersoll-Rand Co., Ltd., Montreal, Que.
Northern Canada Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Mine & Smelter Supply Co.
Mussens, Ltd.
The Wabi Iron Works

Canadian Miners' Buying Directory.—(Continued)

Cables—Wire:
Standard Underground Cable Co of Canada, Ltd
Canada Wire & Cable Co.
Fraser & Chalmers of Canada, Ltd.
Northern Electric Co., Ltd.
Osborn, Sam'l (Canada) Limited.
R. T. Gilman & Co.

Cable Railway Systems:
Canadian Mead-Morrison Co., Limited.

Cam Shafts:
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries, Ltd.

Car Dumps:
Sullivan Machinery Co.
R. T Gilman & Co.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.

Carbide of Calcium:
Canada Carbide Company, Ltd.

Cars:
Canadian Foundries and Forgings, Ltd
Canadian Ingersoll-Rand Co., Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.
John J. Gartshore
MacKinnon Steel Co., Ltd.
The Electric Steel & Metals Co.
Northern Canada Supply Co.
Osborn, Sam'l (Canada) Limited.
Marsh Engineering Works
Mine and Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
R. T. Gilman & Co.
The Wabi Iron Works

Car Wheels and Axles:
Canadian Car Foundry Co., Ltd.
Burnett & Crampton
Hull Iron & Steel Foundries, Ltd.
John J. Gartshore
Marsh Engineering Works, Ltd.
Osborn, Sam'l (Canada) Limited.
The Electric Steel & Metals Co.
The Wabi Iron Works

Carriers (Gravity):
Jones & Glassco

Castings—Brass
The Canada Metal Co., Ltd.

Castings (Iron and Steel)
Burnett & Crampton
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
Osborn, Sam'l (Canada) Limited.
The Electric Steel & Metals Co.
The Wabi Iron Works

Cement and Concrete Waterproofing:
Spielman Agencies, Regd.

Cement Machinery:
Northern Canada Supply Co.
Hadfields, Limited
Hull Iron & Steel Foundries, Ltd.
Osborn, Sam'l (Canada) Limited.
Fraser & Chalmers of Canada, Ltd.
Canadian Fairbanks-Morse Co., Ltd
The Electric Steel & Metals Co.
R. T Gilman & Co.
Burnett & Crampton

Chains:
Jones & Glassco
Northern Canada Supply Co.
Canadian Fairbanks-Morse Co., Ltd
Link-Belt Co.
Greening, B., Wire Co., Ltd.

Chain Drives:
Jones & Glassco

Chemical Apparatus:
Mine and Smelter Supply Co

Chemists:
Canadian Laboratories
Campbell & Deyell
Thos. Heyes & Sons
Milton Hersey Co.
Ledoux & Co.
Constant, C. L. Company

Chrome Ore:
The Electric Steel & Metals Co
Everett & Co.

Classifiers:
Mine and Smelter Supply Co.
Mussens, Limited
Fraser & Chalmers of Canada, Ltd
The Wabi Iron Works
R. T. Gilman & Co.
The Dorr Company

Coal:
Dominoion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Cutters:
Osborn, Sam'l (Canada) Limited.
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd

Coal Crushers:
Canadian Mead-Morrison Co., Limited

Coal Mining Explosives:
Canadian Explosives, Ltd
Giant Powder Company of Canada, Ltd.

Coal Mining Machinery:
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd
Osborn, Sam'l (Canada) Limited.
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.
Marsh Engineering Works
Hadfields, Ltd.
Hendrick Mfg. Co.
Fraser & Chalmers of Canada, Limited
Mussens, Limited
R. T. Gilman & Co.

Coal and Coke Handling Machinery
Canadian Mead-Morrison Co., Limited.
Link-Belt Co.

Coal Pockets:
Canadian Mead-Morrison Co., Limited.

Coal Pick Machines:
Sullivan Machinery Co.

Coal Screening Plants:
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:
The Mine & Smelter Supply Co.

Conveyor Flights:
Hendrick Mfg. Co., Ltd.

Conveyor—Trough—Belt:
Canadian Fairbanks-Morse Co., Ltd
Link-Belt Co.
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.

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.
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.

Crude Oil Engines:
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 Mine & Smelter Supply Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd
The Wabi Iron Works

Canadian Miners' Buying Directory.—(Continued)

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., Rockawaw, N.J
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.
Sullivan Machinery Co.
Northern Canada Supply Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd
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, Que
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—Stationery:
Swedish Steel & Importing Co., Ltd.

Engineers:
The Dorr Co.

Ferro-Alloys (all Classes):
Everitt & Co.

Feed Water Heaters:
MacGovern & Co.

Flashlights—Electric:
Spielman Agencies, Regd.

Flood Lamps:
Northern Electric Co., Ltd.

Flourspar:
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.

Gears (Cast):
Hull Iron & Steel Foundries, Ltd.
The Link-Belt Co.

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.

Hose (Fire):
Goodyear Tire & Rubber Co.

Hose (Packings)
Goodyear Tire & Rubber Co.

Hose (Suction):
Goodyear Tire & Rubber Co.

Hose (Steam):
Goodyear Tire & Rubber Co.

Hose (Water):
Goodyear Tire & Rubber Co.

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, Ltd

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, N.J

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
Link-Belt Co.

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.
Northern Canada Supply Co

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.

Levels:
C. L. Berger & Sons

Locomotives (Steam, Compressed Air and Storage Steam:
Canadian 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.
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

Metallurgical Engineers:
The Dorr Co.

Metallurgical Machinery:
The Dorr 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.J

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.

Ore Sacks:
Northern Canada Supply Co.

Ore Testing Works:
Ledoux & Co.
Can. Laboratories
Milton Hersey Co.
Campbell & Deyell
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.

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.
Jones & Glassco
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, L
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
mart-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.

Rails:
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.

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.
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.
Link-Belt Co.

Screens—Cross Patent Flanged Lip:
Hendrick Mfg. Co.

Screens—Perforated Metal:
Hendrick Mfg. Co.

Screens—Shaking:
Hendrick Mfg. Co.

Screens—Revolving:
Hendrick Mfg. Co.

Scheelite:
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.

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

Special Machinery:
John Inglis Co., Ltd

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

Sprockets:
Link-Belt Co.

Spring Coil and Clips Electrico:
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.
Northen 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):
Hendrick Mfg. Co.

Stone Breakers:
Hadfields, Limited
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.

ulphate 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.
The Wabi Iron Works

Tanks—Cyanide, Etc.:
Hendrick Mfg. Co.
Pacific Coast Pipe Co.
MacKinnon Steel Co.
Fraser & Chalmers of Canada, Ltd.
Mine & Smelter Supply Co.
The Wabi Iron Works

Tanks—Steel:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Chicago Bridge & Iron Works
Marsh Engineering Works
Osborn, Sam'l (Canada) Limited.
MacKinnon Steel Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
Hendrick Mfg. Co.
The Wabi Iron Works

Tanks—Oil Storage:
Canadian Chicago Bridge & Iron Works
The Mine & Smelter Supply Co.

Tanks (water) and Steel Towers:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Chicago Bdidge & Iron Works
Gould, Shapley & Muir Co., Ltd.
MacKinnon Steel Co.
Mine & Smelter Supply Co.
The Wabi Iron Works

Canadian Miners' Buying Directory.—(Continued)

Tramway Points and Crossings:
Canadian Steel Foundries, Ltd.
Hadfields, Limited

Transits:
C. L. Berger & Sons

Transformers:
Canadian Fairbanks-Morse Co., Ltd
R. T. Gilman & Co.
Northern Electric Co., Ltd.

Transmission Appuiances:
Jones & Glassco

Troughs (Conveyor):
Hendrick Manufacturing Co

Trucks—Electric:
Canadian Fairbanks-Morse Co., Ltd.

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:
Prest-O-Lite Co. of Canada, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Imperial Brass Mfg. Co.

Wheels and Axles:
Canadian Steel Foundries, Ltd.
Hadfields, Limited
The Electric Steel & Metals Co.
The Wabi Iron Works

Winches—Power Driven:
Canadian Mead-Morrison Co., Limited.

Winding Engines—Steam and Electric:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Marsh Engineering Works
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
Mussens, Limited
R. T. Gilman & Co.
The Wabi Iron Works

Wire:
Canada Wire & Cable Co., Ltd.
Greening, B. Wire Co.

Wire Rope:
R. T. Gilman & Co.
Canada Wire and Iron Goods Company.
Dominion Wire Rope Co., Ltd.

Wire Rope Fittings:
Canada Wire and Iron Goods Company.

Wire Cloth:
Northern Canada Supply Co.
Greening, B. Wire Co.
Canada Wire & Iron Goods Company

Wire (Bars and Insulated):
Standard Underground Cable Co. of Canada, Ltd.
Northern Electric Co., Ltd.

Wolfram Ore:
Everitt & Co.

Woodworking Machinery:
Canadian Fairbanks-Morse Co., Ltd.

Zinconium:
Everitt & Co.

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

Zinc Spelter:
Canada Metal Co., Ltd.
Hoyt Metal Co., Ltd.

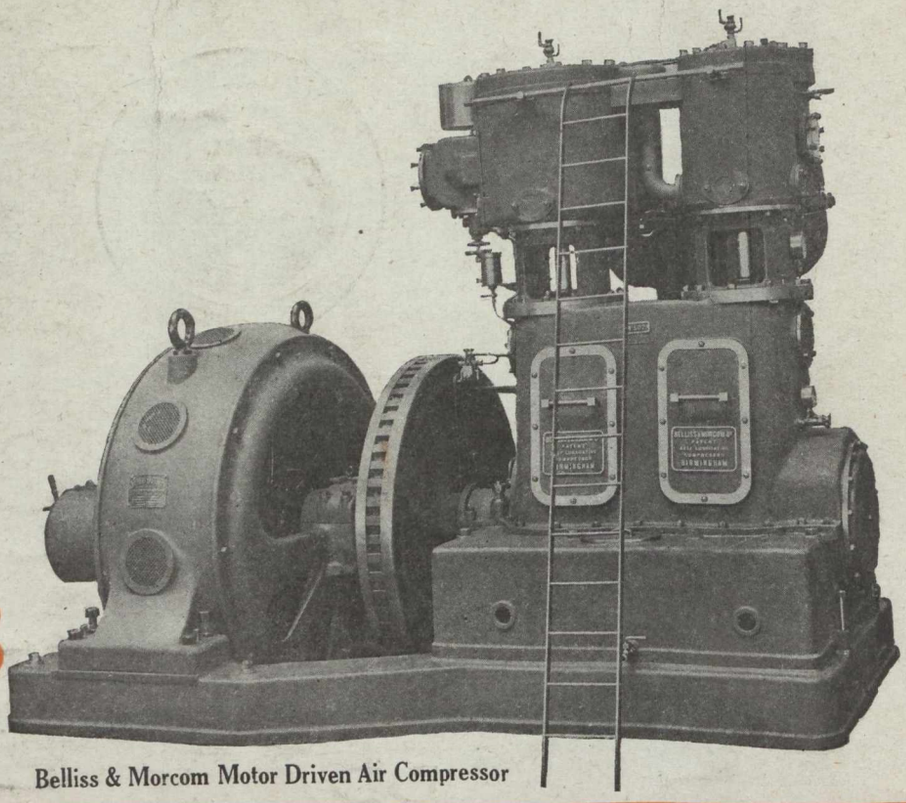
ALPHABETICAL INDEX TO ADVERTISERS

BELLISS & MORCOM

Air Compressors
Diesel Engines
Steam Turbines
Steam Engines
Condensers

LAURIE & LAMB

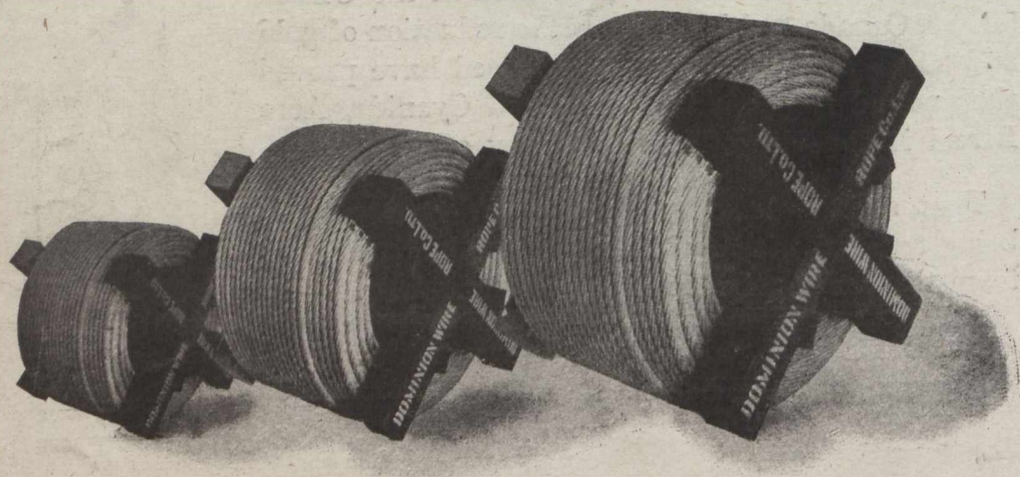
211 Board of Trade Bldg.
MONTREAL



Belliss & Morcom Motor Driven Air Compressor

"MADE IN CANADA"

"DOMINION" WIRE ROPE



for
Mining,
Hoisting,
Haulage.

for
Cableways,
Tramways.

The Dominion Wire Rope Company, Limited

Head Office: MONTREAL

Stocks carried at: TORONTO
WINNIPEG