

CANADIAN MINING JOURNAL

Vol. XLI.

Garden City Press, Ste. Anne de Bellevue, April 30, 1920.

No. 17

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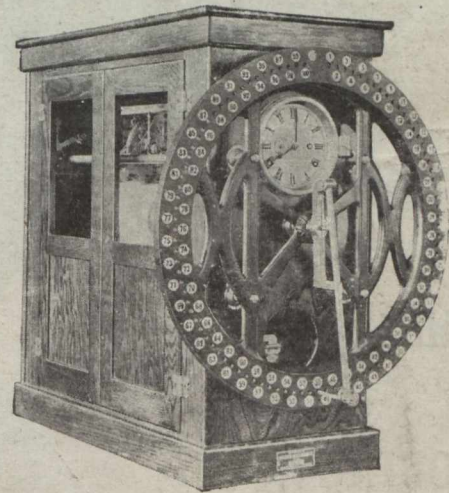
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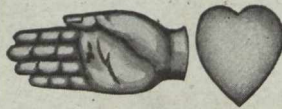
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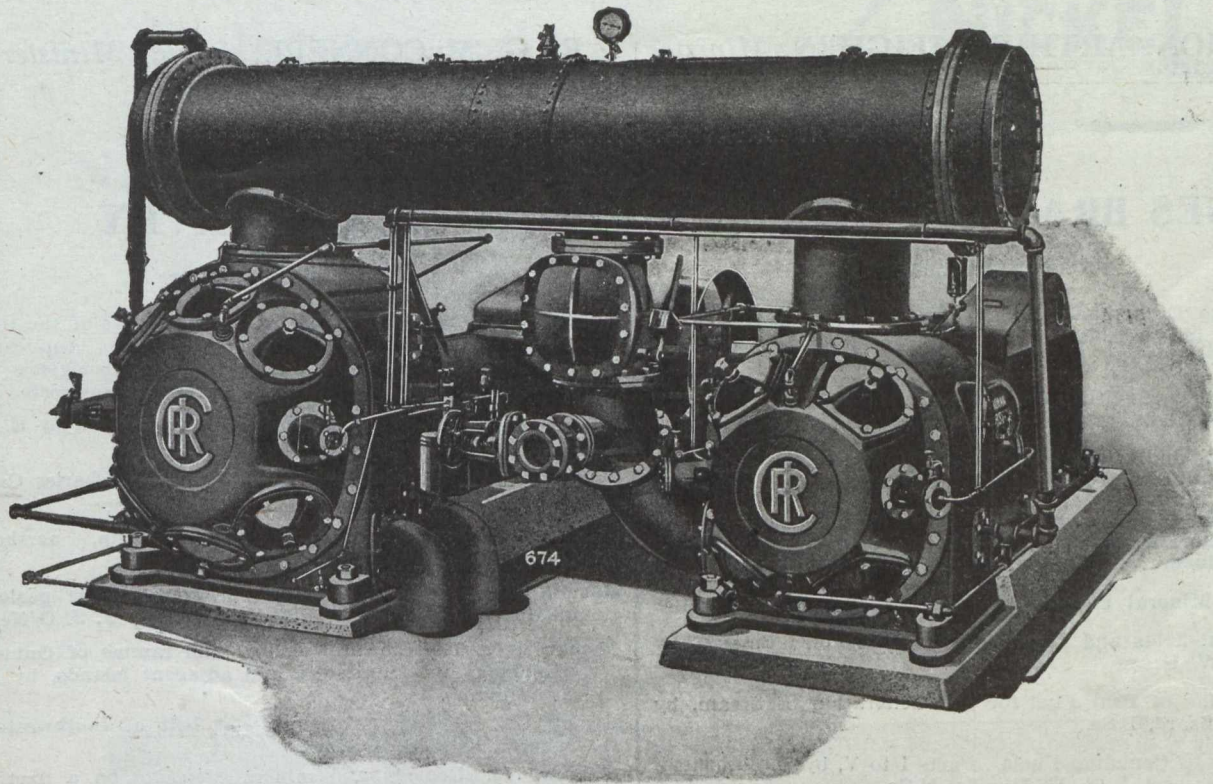
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Recent Publications

Iron Ore Occurrences in Canada, Vol. II. Compiled by E. Lindeman, M.E., and L. L. Bolton, M.A., B.Sc. Introductory by A. H. A. Robinson, B.A.Sc.

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

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

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

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

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

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

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

Clay Resources of Southern Saskatchewan, by N. B. Davis, M.A., B.Sc.

Summary Report of the Mines Branch, 1918.

The Mineral Springs of Canada. Part II., by R. T. Elworthy, B.Sc.

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

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

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

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

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

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

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

GEOLOGICAL SURVEY

Recent Publications

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

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

Memoir 108. The Mackenzie River basin, by Charles Cam-sell and Wyatt Malcolm.

Memoir 109. The Harricanaw-Turgeon basin, northern Quebec, by T. L. Tanton.

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

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

Memoir 112. Geology of the district belt of southwestern Alberta, by J. S. Stewart.

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

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

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

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

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

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

Map 1585. Mackenzie River basin. Geology.

Map 1680. Portions of Grenville, Harrington, Chatham and Wentworth townships, Argenteuil county, Quebec. Geology.

Map 1708. Bridge river, Lillooet district, B.C. Topography.

Map 1712. Foothills of Southern Alberta, St. Mary river to Hig:wood river. Geology.

Map 1714. The Niagara peninsula, Ontario. Geology.

Map 1715. The Ontario peninsula. Geology.

Map 1724. Sheep River, Alberta. Geology.

Map 1726. Athapapuskow Lake region. Geology.

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

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

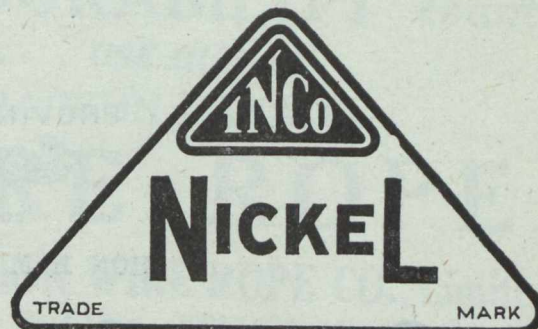
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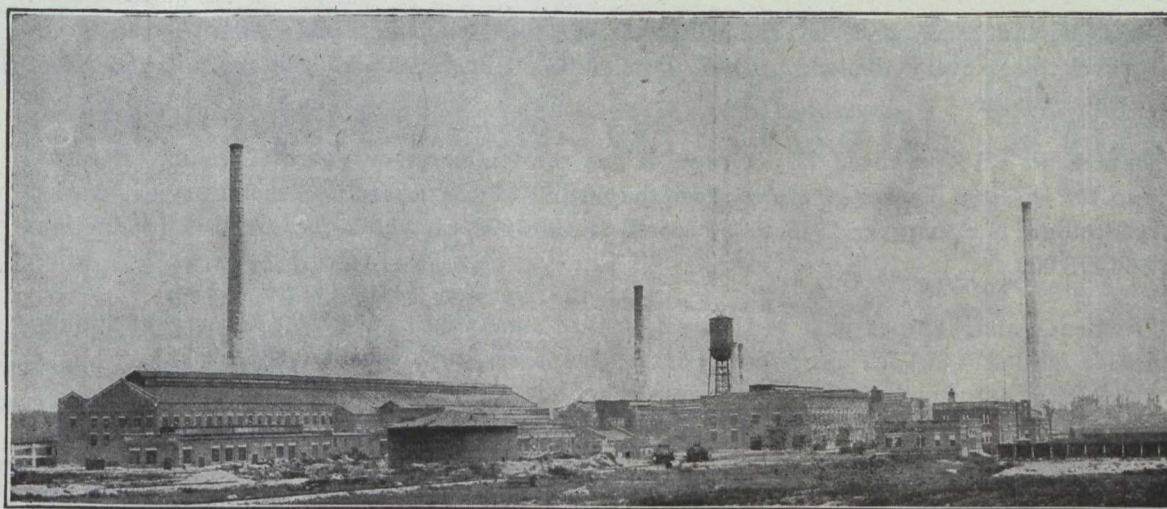
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Building materials, such as ornamental marble, limestone sandstone, granite, trap, sand and gravel, meet every demand. Lime, Portland cement, brick and tile are manufactured within the Province.

Ontario in 1918 produced 45 per cent. of the total mineral output of Canada. Returns made to the Ontario Bureau of Mines show the output of the mines and metallurgical works of the Province for the year 1918 to be worth \$80,308,972 of which the metallic production was \$66,178,059.

Dividends and bonuses paid to the end of 1918 amounted to \$13,359,210 for gold mining companies, and \$74,810,521 for silver mining companies, or a total of \$88,169,733.

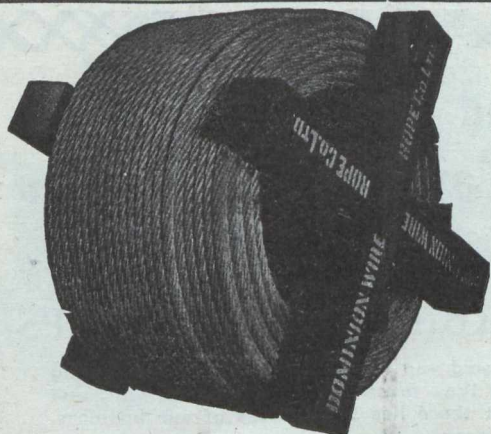
The prospector can go almost anywhere in the mineral regions in his canoe; the climate is invigorating and healthy, and there is plenty of wood and good water. Hydro-electric power is available in many parts of the Province, and many undeveloped water-powers remain to be harnessed. A miner's license costs \$5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 240 day's assessment work on a claim, patent may be obtained from the Crown on payment of \$2.50 or \$3.00 per acre, depending on location in surveyed or unsurveyed territory.

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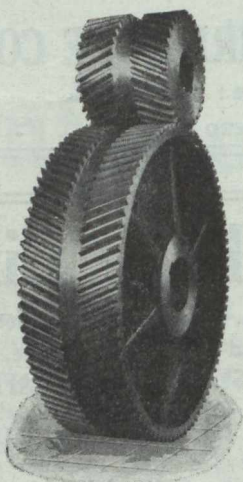
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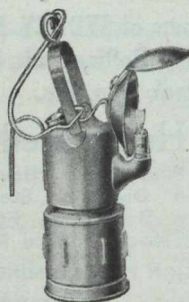
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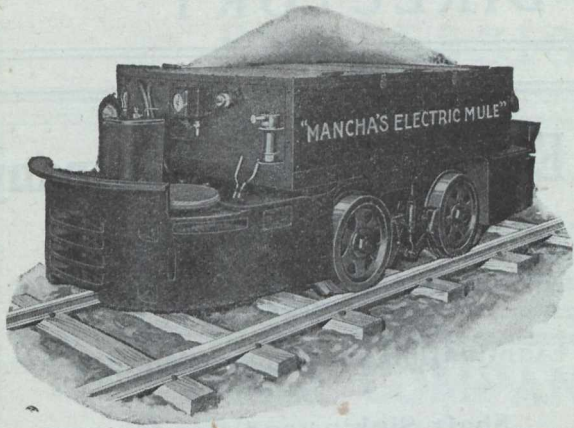
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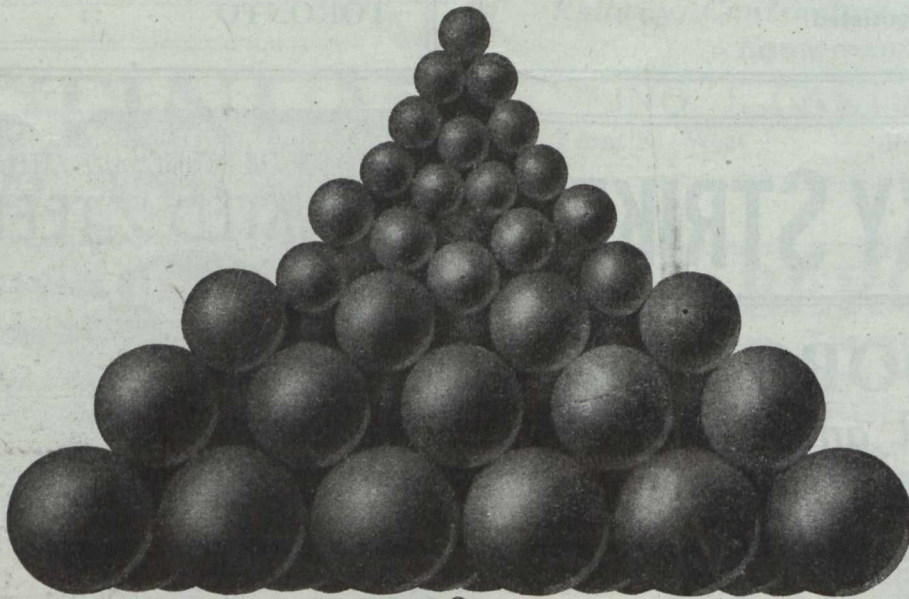
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EDITORIAL

The Choice of Underground Illumination

A recent advertisement of a well-known type of oil safety-lamp under the caption "Fortunate Escape from Fearful Disaster" relates that on February 27th a blower of gas filled the workings of the Ponthenry Mine in Gwendraeth Valley, South Wales, and extinguished all the lamps. It is assumed that the fortunate escape of all the workmen, save one, was due to the use of the oil safety-lamp, and the advertisement proceeds: "One shudders to think what would have happened if the pit had been fitted with electric lamps wherewith the men could have gone on working until they had all been fatally overcome with gas." The supposition is a very large one, and is open to a good many qualifications.

The writer recollects an occurrence of this nature in South Yorkshire, where a blower of gas issuing from the floor fouled the intake air up to the fan-drift itself. The workmen in the district affected remained at work until their lamp gauzes were red-hot. The boys at work became frightened quickly and made for the slope-mouth, but the men had to be fetched out by the officials. There was little doubt of the nearness of a disaster in this instance, and one defective lamp would have caused an explosion.

In the absence of particulars as to the nature of the gas in the blower at Ponthenry Mine, it would be useless to comment on the rapidity with which the safety-lamps are stated to have been extinguished, and, if the gas were methane, then it must have been in tremendous volume, containing a non-explosive atmosphere (and of course non-respirable) near the blower, and an atmosphere of limitless explosive possibilities on the fringe of the gas-filled district where admixture with air in explosive proportions presumably existed. Under such circumstances the extinction of the oil-flame lamps was not an unmixed evil, as it lessened the danger of explosion in escaping from the mine should a defective lamp have been present. At the same time, the men lost their lights, and presumably had difficulty in escaping in the dark.

What would have been the conditions had the mine been worked by electric lamps? There would without doubt have been provided the necessary number of oil-lamps, in the hands of officials, for the very pur-

pose of detecting a condition of the mine atmosphere dangerous to life. Such a condition might arise from the presence of inflammable gas, but might also be caused by the presence of carbon di-oxide, which the oil-lamp would show; or the presence of carbon monoxide, which the oil-lamp would not indicate. Warning would have been given and the men could have escaped, but without running the danger of causing an explosion at the point where an explosive atmosphere existed.

We believe the incident quoted in the advertisement referred to is just as good an example of the dangers of the oil-lamp as it is of the electric lamp. The electric lamp has only one drawback to its general use in collieries, and that is its inability to detect atmospheric changes. This drawback can be easily overcome by appointing officials, who would carry both oil and electric lights, to observe atmospheric conditions and take the necessary measures.

The chief defect in the oil safety-lamp is the insufficient and partial nature of the illumination it gives, and there is no question at this date but that the oil safety-lamp is the cause of miners' nystagmus. The evidence accumulated on this point by Sir Josiah Court, and recently published, is overwhelmingly convincing, and it is an instance of the paralysing effect of an accepted idea that the oil safety-lamp should have remained for so many years in general use, despite the unsatisfactory nature of the illumination it afforded. The portable cap-light type of electric storage-battery lamp affords an ideal illumination for the miner, and as the idea gradually gains force that any form of flame is objectionable in a colliery, whether it is protected by gauzes or not, the electric miners' lamp will come more and more into favor. Only those who have had experience of colliery lamp-house reports know just how many things can happen to an oil-flame safety-lamp to make it anything but what it purports to be. The additional expense connected with electric lamps, as compared with flame lamps, is not of sufficient importance to cause hesitation in adopting the electric lamp once it is acknowledged that the incandescent light is safer than the flame.

Propagandists of Hate

Propaganda may be cunningly disguised, but it is usually possible for the discerning reader to distinguish the well-timed and recurrent contributions of the propagandist from the ordinary news of the dailies and periodical press.

It is not difficult, therefore, to detect in the unusual amount of space that the newspapers of the United States and those of the British Empire are devoting to oil occurrences and their exploitation the influence of the powerful rival groups of interests that seek the domination of the oil occurrences of the World.

There is nothing that is inherently wrong, or even novel, in this quite apparent condition, if the protagonists of the competing interests will confine themselves to proper limits of discussion. In astuteness and vision, the financiers of the United States and those of the British Empire are a fair match. They have many times in the past pitted their wits against each other, or have combined them against a common rival, as may have seemed to them at the time desirable, without rancor, and according to the ethics of the business game. All they have hitherto asked has been a fair field and no favor. Each has placed a premium on brains, and has been willing to pay good men well for services rendered.

Latterly, however, another and a less worthy spirit seems to have obtained prevalence, although it has not yet obtained predominance. This spirit is traceable to injudicious, provocative and short-sighted propaganda, emanating from private interests, but purporting to express national and racial ambitions. Strangely enough, this overdone and false expression of national aims is a product of the war. It might have been thought that the example of the Prussian, who discussed world trade in terms of military strategy, and made such an awful mess of his grandiose plans, would have cured the other nations of a similar wicked obsession, but on the contrary, the virus has spread, and those who before the war were business friends and won the war together, now see their comradeship endangered by newspaper writings that dilate upon ordinary competitive business affairs much as an Economic Committee of the Prussian General Staff might have reported to their War Lord.

There are some phases of a nation's internal economy that call for publicity, and the inculcation of a national concern; such as for example, the fuel problem of Canada. This is a question of national defence, because it is essentially a question of national existence. Public discussion of such matters is desirable, and should be frankly undertaken in the open. Our friends in the United States—that is all those whose friendship is worth having—will take no umbrage if Canada undertakes to become thoroly self-sup-

porting wherever it shall prove possible. They will admire us for so doing, and conversely they will secretly despise us if Canada unnecessarily places herself in a mediant attitude. On all such questions open discussion is possible, because the matter is one of public interest.

But apart from pressing matters of our own internal economy, of which coal is the most typical instance, nothing is to be gained, and much may be lost by irresponsible discussion in the newspapers of the supposedly high strategic aims of the political leaders of the United States and the British Empire, aims that do not exist, but which, correctly interpreted, will be found to bear on the real aims of rival oil interests. Apparently these people do not care whether they embroil the United States and Mexico in war, or whether they split the alliance between Britain and the United States that won the war, but looks like losing the peace; causing some people to wonder whether civilization can even yet be saved, and whether it is really worth saving, if all the people of North America have gained from their fighting comradeship has been the absorption of the Prussian viewpoint.

The journalist, or paid propagandist, who endeavours to cause friction between the United States and the British Empire is a most dangerous criminal, and he is especially dangerous in Canada. We suggest that cables from London Sunday newspapers, which appeal to an audience which is not representative of the sentiment of the British Empire, and is certainly not representative of Canadian sentiment, should be read with large allowances; and that, similarly, items appealing to similar audiences in the United States, relating to the malgin purposes of the British in securing oil concessions in the Himalayas or round the Great Slave Lake in Canada, for example, should be generously discounted. Also, it would be much better for the oil interests, and for the peace of the world, if these gentlemen would be frank about their commercial aims, and would discontinue their pretence to pose as the champions of national aims, and as the exponents of grandiose schemes that are not one whit better morally, and just as likely of success, as the proposals of Von Bernhardt in "Der Naechste Krieg".

Bolshevism is originally a reflex of the disillusionment of deceived men who have seen their genuine love of country prostituted to base uses by rulers who dreamed and planned wickedness. This is the grain of truth behind the puzzling belief of labor that capital caused the war, and those who play fast and loose with patriotism for purely commercial ends are toying with the same forces which were unloosed in a recent war that is still running its course despite official peace treaties.

*ECONOMIC DEPENDENCE OCCASIONS
POLITICAL SUBSERVIENCY.*

It is not necessary, in a Canadian paper, to discuss the taste of Senator Underwood in speaking of the Crown Lands of Canada as though they were an adjunct of his own country. Canada believes she has the right to decide what she will do with her own, and any talk of retaliation by the United States is a challenge to Canada's sovereignty and a threat against the comity of nations.

The threat to place an embargo on coal and sulphur will be of interest to our readers only as a further instance of the necessity for Canada to become self-supporting in the matter of coal supply. The Canadian coal market is not really a question of much importance to the United States' producer. A country that can mine 700,000,000 tons of bituminous coal, and 90,000,000 tons of anthracite annually, and could probably with ease reach an output of a billion tons annually if it so desired, is not likely to worry much about the small tonnage it imports into Canada, although that tonnage from the Canadian point of view is a question of the supremest importance. It is nothing to the United States, but it is life to Canada.

This paper has endeavoured to present the national aspect of coal production in Canada, and we have urged that dependence upon a neighbour for a raw material that is a prime necessity of national existence must inevitably lead to political subservience. This is exactly the threat implied by Senator Underwood, who, because Canada is so largely dependent upon the United States for coal, argues that this fact gives the United States a lien and a prescription upon our pulpwood resources.

These may be harsh words, but they are not harsher than the facts warrant. If Canada, through desire for ease, and a disinclination to tackle the difficulties of our fuel problem, puts herself in the position of a poor relation, then we must put up with insults and reminders of our dependency.

Senator Underwood does not mention, when he puts United States' cotton against Canadian pulpwood, that cotton is an annual crop, and that our pulpwood is a heritage that carries an entail, and is not replaceable.

Canada can buy cotton elsewhere within the British Empire. She can produce all the sulphur that is necessary from her own mines. And she can produce—if not all the coal our country requires—very much more than Canada has ever yet produced.

It is not so long not ago that Mr. McAdoo suggested the purchase of the British West Indies by the United States. Mr. McAdoo had apparently overlooked Mr. Wilson's pronouncement on the handing over of populations to foreign jurisdictions, which of course was

only a pronouncement, and is not yet a part of international law. But what is most disturbing about Mr. McAdoo's suggestion is that anyone in his position could conceive that there was any power resident within the British Empire that could "sell" British soil and British citizens and voters. Citizens of the United States, no matter how exalted their position in their own country, have no right to discuss the internal politics of Canada, the West Indies, or any other part of the British Empire. If they do, then they presume, and lay themselves open to the dangers of minding other peoples' business.

It is not likely that the United States, through its official representatives, will be associated either with Mr. McAdoo's suggestion, or Senator Underwood's remarks, because the limitations of national sovereignty are well understood, and such suggestions would receive the answer they deserve. It is not surprising to know that Senator Underwood, when asked as to the attitude of the State Department, said "he believed it was one of hostility". In other words, it is a correct attitude.

The lesson is that no country should voluntarily, and unnecessarily, place itself in a position of economic dependence. In the matter of coal supply, Canada has done this.

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The Consolidated Company treated every employee alike, this in spite of the fact that a number of miners are employed by them, the officials decided to pay the large extra premium in order to bring all under the group system of insurance.

Group Insurance is rapidly making headway in Canada and the policy just issued calls for the payment of \$500 to the widow or relatives of every employee, who has been working for the company for six months, the amount of insurance increasing \$100 for every additional six months' service, with a maximum of \$1,500.

The company have a number of returned soldiers and sailors in their employ. The length of service of these men for the company before the outbreak of war will be taken into consideration. This is an exceptionally good feature, which the returned men appreciate.

Correspondence

Peace River Oil Formations.

The Editor

"The Canadian Mining Journal."

Dear Sir:—

The following paragraphs appeared in the Journal of April 9th, page 292, which are part of Mr. D. B. Dowling's address before the Annual Meeting of the Canadian Mining Institute.

"On the plains most of the prospecting has of late years been centred in the Peace river valley, where several wells averaging eleven hundred feet in depth pass through sands impregnated with heavy oil. The flow is necessarily slow and although the presence of oil seems to be proven, no production has been attempted possibly on account of the trouble with water which can generally be attributed to insufficient or defective casing, and to lack of restraint on the part of the operators in drilling through the oil sand into the water bearing bed which lies below it."

"The belief that is so general among the drillers, that the really profitable oil horizon is in the limestone of the Devonian which lies beneath the oil impregnated sands of the lower Cretaceous has led indirectly to the spoiling of several possible productive wells in the Peace River field, as with the object of reaching the limestones, borings have been continued below the heavy oil of the Cretaceous into the water-bearing beds which overlie the Devonian limestone."

The writer has had for a considerable period conditions, as exist in the Peace River District, under investigation, and does not admit of the correctness of Mr. Dowling's statement.

In reading Mr. Dowling's address other references are made to the possibilities of finding oil in the middle Devonians, and I quite agree with Mr. Dowling as to such a possibility; but in my mind should oil be found in this formation, it will occur merely in segregated pools, and therefore will not lead to an oil field of great production. The characteristics of the field would be more or less similar to the Western Ontario field, which field is not to be depreciated in any way, but if a similar field were found in the Sub-Arctic regions (comparatively speaking), it would have little commercial value, owing to conditions of transportation, population, etc. Such a field, however, would be a great boom to the immediate vicinity.

Without doubt the management and operation of drilling in this Northern region have been carried on very inefficiently, and I believe this condition to be wholly responsible for the failure in reaching a point where the wells could be claimed even a successful prospect.

Personally I know of no operators who have ever had the intention of drilling to find oil below the limestone. (This of course with the exception of those wells which were started at the limestones). Such a decision might have been formulated after close ex-

amination of logs, once the limestone was reached. Further, I know of no information which would lead one to believe that the sandstone in which the large flow of water and natural gas was encountered was a sandstone directly above the limestone, but indeed to the contrary. I have been informed that one well, after sinking through about thirty feet (30 ft.) of this water and gas bearing sandstone, reached a quite impervious shale, but which they were unable to drill into more than five feet (5 ft.) before the high pressure above caused their casing to fail. The claim was made that previous to failure no water was entering their well, while in this shale. (I cannot vouch for the correctness of this information.)

The occurrence of heavy oil at various depths, and last the heavy pressure of gas and water, when considered in connection with conditions existing in other oil fields, brings out that the only decision possible of any operator would be to continue drilling to prove conditions as far as the limestone. It is not at all unlikely that the water and gas-bearing sandstone would be found considerably above the limestone and separated from it by considerable thicknesses of more or less impervious shale. If under this pressure these conditions existed, and if the formation immediately above the limestone were of a porous nature, it is not out of the way to state that conditions are well suited for the accumulation of oil in large quantities. (It must be understood that other characteristics of the field are to be taken into consideration in making this statement.)

The lot of the engineer is not the easiest, as it is quite impossible to foretell the existence or otherwise of oil, but it is quite possible for him to select locations after very detailed investigations where conditions are structurally best suited for successful operations.

From the result of detailed surveys I believe the limestones will not be reached at the location immediately below Peace River Crossing (Tar Island anticline), till about sixteen hundred (1600 ft.) and possibly more. The water and gas pressure was encountered at about eleven hundred (1100 ft.), which allows considerable leeway for conditions as outlined above.

If Mr. Dowling's position and reputation were other than they are, namely: the very best, I would not criticize in any way the statement, but when given publicity Mr. Dowling's statements are serious, and I believe in this case would bear considerable influence in affecting adversely the continuation of legitimate operations in the field mentioned.

The heavy oil encountered may at some later date prove to be of commercial value, but I distinctly doubt its value at the present date. It is regrettable that the operators did not take better care of their casing, so that the high water pressure could be controlled, and even now strenuous efforts should be taken so that this water pressure can be excluded from the upper oil bearing strata.

Mr. Dowling's statement concerning other possible fields in the West is very timely, and he is to be congratulated on the clearness of his argument.

Yours truly,

G. M. PONTON.

Ottawa, April 17, 1920.

Calculations on Inclined Haulages

JOHN S. WATTS, New Glasgow, N.S.

The purpose of this article is to give a full and clear account, of how to calculate the horse power to handle a given amount of coal, or other material on an inclined slope or haulage plane.

The formulae and directions given in the technical books, on this subject, neglect to take into account the power or pull required to accelerate the loaded trip, and the time required to accelerate and decelerate the load, both of which have a considerable influence on the total time taken to make a trip, and therefore upon the daily output of the slope.

The simplest, and most usual case, is that of a straight incline at the same grade the whole length, and the factors that are known are, the grade and length of the incline, and the daily output required.

Generally also the weight and carrying capacity of the cars are known, or are fixed by conditions in the mine.

The first point to be decided is the maximum speed of hoisting, which depends upon the condition of the track, the better the quality of the track, and of the car wheels and journals, the higher the speed at which the cars can be safely run.

If the mine is a small one, it will be cheaper to purchase one of the standard hoisting engines, in which case the speed must be that of the hoist of the required power.

However, in the absence of any reasons to the contrary, it may be taken that 500 feet per minute, will be a "safe and sane" speed at which to run the trip, and is average practice.

Having the maximum speed at which the hoist will run, and the daily output required, we can now estimate approximatively the time it will take to make one trip, and from that the number of cars we must haul per trip to get the desired output.

In making this estimate, allowance must be made, for the time taken to accelerate the trip to full speed, and for bringing it to rest. Also for the time necessary to change the trips at top and bottom.

It is necessary at the first attempt to make the above estimates, but after working out the calculations on that basis, we can cut and try again for the final result.

In referring to the grade of the incline, there are three systems of stating its amount. for example we may say, 1st, that the inclination is 1 in. 20, meaning that the vertical rise is one foot for each twenty feet of horizontal length; 2nd, that the inclination is 5 per cent, that is the vertical rise is 5 per cent of the horizontal length; 3rd, that the inclination is at an angle of 2°-52' to the horizontal.

All three of the above examples, represent actually the same inclination, and the third method is the one required for the basis of our calculation.

The first way of stating the grade of the incline can be converted into the third, that is degrees, by noting that the second quantity, that is 20, is the cotangent of the angle. By looking up a table of cotangents, we find that 20 is the cotangent of the angle of 2°-52'.

Similarly, the second way, can be converted into degrees by noting that the percentage of the grade $\div 100 =$ the tangent of the angle, from a table of tangents we find .05 is the tangent of the angle 2°-52'.

To calculate the total pull on the rope, we have the following:—

- (1) Pull due to weight of loaded trip = Weight of loaded trip \times sine of angle.
- (2) Pull due to friction of loaded trip = Weight of loaded trip \times coefficient of friction.
- (3) Pull due to weight of rope = Weight of rope \times sine of angle.
- (4) Pull due to friction of rope = Weight of rope \times coefficient of friction.
- (5) Pull due to acceleration of trip =

$$\frac{\text{Weight of loaded trip} \times V}{G \times T}$$

- (6) Pull due to acceleration of rope =

$$\frac{\text{Weight of rope} \times V}{G \times T}$$

Where, V = maximum velocity in feet per second.

G = acceleration due to gravity = 32.16.

T = time of acceleration, or time taken to reach the maximum velocity in seconds.

Taking each of the above formulae in rotation:—

- (1) Presents no difficulty.
- (2) We have to know the coefficient of friction which is the absence of information from actual test on the cars in question, may be taken as being between .004 and .02, the lower figure being sufficient when the cars and tracks are in good average condition. The higher coefficient will only be correct under the worst conditions, such as frozen bearings, worn journals and uneven track. Under the usual conditions, the coefficient of friction to be used, is that of the cars in motion, not the coefficient required to start the cars from rest. This is because the pull allowed for acceleration plus the pull allowed for the moving friction, will be together greater than the pull required to start the cars from rest. This latter pull is only momentary, and the acceleration does not commence until after the cars are started moving.
- (3) We require to know the total weights of the rope, and to get this we must estimate the size of rope that will be required and correct this later if necessary.
- (4) Includes the coefficient of friction of the rope on its guide rollers, and in the absence of more precise information may be taken as .002, which is about correct for rope carried on rollers spaced about 25 feet apart. It should be noted at this point, that in No. 2 and No. 4 formulae, the friction will be reduced as the angle of the slope increases. This reduction is very slight for angles under 15°, and need not be considered unless the slope is steeper than that. For steeper slopes, the correction is made by multiplying the answer as calculated by formulae No. 2 and No. 4, by the cosine of the angle.

(5) To work out this formulae, we have to know the time, T, which we will allow for acceleration. And, as in the majority of cases, an empty trip is going down, while the full trip is coming up, this time of acceleration cannot be less than that taken by the descending cars to reach the maximum velocity under the action of gravity. This time can be calculated from the formulae:

$$T = \frac{V}{(\text{sine of angle} - \text{coefficient of friction}) \times G}$$

(6) Needs no comment, except that, of course, T is the same time as in No. 5.

Now adding together, the results of our calculations in formulae Nos. 1, 2, 3, 4, 5 and 6, we get the total maximum pull on the rope, which multiplied by the maximum speed of the rope in feet per minute, and divided by 33,000, will give us the brake horse power required in the hoisting engine.

However, as most of the makers of hoisting engines, specify the actual pull on the rope, that their engines will deliver, we do not usually need to specify horse power at all.

If the horse power must be given, one third should be added to the Brake Horse Power, as calculated above, to find the Indicated Horse Power required. This one third being necessary to overcome the friction of the gearing and engine.

Now to calculate the actual total time taken for one trip, we have

$$\begin{aligned} \text{The time of acceleration} &= T \\ \text{'' '' '' maximum velocity} &= T_1 \\ \text{'' '' '' deceleration} &= T_2 \end{aligned}$$

The time of acceleration, we have already, being T in formula 5.

The time of deceleration, cannot be less than that in which the cars will come to rest by the action of gravity, which is

$$T_2 = \frac{V}{(\text{sine of angle} + \text{coefficient of friction}) \times G}$$

To find T₁, we must first calculate the space travelled over during the times of acceleration and deceleration which is

$$\text{Space during acceleration period} = \frac{V \times T}{2}$$

$$\text{Space during deceleration period} = \frac{V \times T_2}{2}$$

Adding these two lengths together, and deducting the sum from the total length of the slope, we have remaining the length to be travelled at full speed, and the time required will be that length divided by the maximum velocity, which added to the times of deceleration and acceleration, will give the total time of the haul. To this amount must be added the time required to change trips, and from the sum, we can calculate the number of trips per day.

From the above calculations it will appear that the period of maximum load is during the acceleration

period, and that during this time the engine receives no assistance from the empties going down, as they are simply gathering speed under the action of gravity, that is on an incline of regular grade.

The incline that would give a nearly uniform load on the engine, would be one that started off at the bottom on a low grade, changing to the regular grade at the point where the maximum velocity is reached, and, at the top, increasing the grade so that the empties would assist the engine in accelerating the full trip.

If the reasoning in the calculations set out above is understood there will be no difficulty experienced in making the calculation for an incline with varying grades.

Sometimes it is required to know what output can be expected from an engine which will deliver a certain pull on the rope, at a given speed, and this problem can be solved as follows:

Calculate the pull due to the weight of the rope, its friction, and acceleration by formulae 3, 4 and 6, and deduct the sum of these amounts from the total available pull on the rope, the balance will be the pull we have left to take the weight of the trip, its friction and acceleration, which pull is divided up as follows:

From formula 1. Pull due to weight of trip = weight of trip × sine of angle.

From formula 2. Pull due to friction of trip = weight of trip × coefficient of friction.

From formula 5. Pull due to acceleration of trip = weight of trip

$$\times \frac{V}{G \times T}$$

As the sum of these three pulls, must equal the available balance left, we have

Balance of pull, available for trip = weight of loaded trip ×

$$\left(\text{sine of angle} + \text{coefficient of friction} + \frac{V}{G \times T} \right)$$

For the first attempt, we must estimate the time of acceleration, T, and correct if necessary.

The above formula transposed becomes

$$\text{Weight of loaded trip} = \frac{\text{Balance of pull available for trip}}{\text{sine of angle} + \text{coefficient of friction} + \frac{V}{G \times T}}$$

Having the weight of the loaded trip, we can calculate the time taken for the haul, on the same lines as given above, and thus arrive at the daily output.

A ZOOLOGICAL CURIOSITY.

"The complaint was made that men came to the district and asked inflated prices for shares, far above the market value, and it was argued that the new exchange would tend to obviate this system of sharks feathering their nests."—"Punch" from a Lancashire paper.

First Annual Report of the Explosives Division of the Department of Mines, 1919

The first annual report of the Explosives Division of the Department of Mines is issued. The formation of this Division has been under consideration since 1909, so that it took exactly ten years to get this much required undertaking commenced, although its necessity has been undenied since the Explosives Bill was drafted in 1910, and although both in the United States and in Gt. Britain such supervision over the manufacture and use of explosives in mines has long been in force.

The Explosives Act was assented to in June 1914, but was not proclaimed as effective until 1st of March this year.

The staff of the new Division is composed of the Chief Inspector, Lt.-Col. G. Ogilvie, R.A., Mr. J. G. S. Hudson, Dr. A. E. MacIntyre, and Mr. G. B. Frost. With regard to the qualifications of these officers, Col. Ogilvie states:

Staff of the Division

"Concurrently with my appointment as Chief Inspector on April 15, 1919, the services of Mr. J. G. S. Hudson, Explosives Engineer of the Mines Branch, were made available and placed at the disposal of the division. Mr. Hudson, while on the staff of the Mines Branch, and in addition to his duties, been engaged in the work connected with the enquiries which gave rise to the first drafting of the Explosives Act, including a tour of inspection with Captain Desborough, and had subsequently conducted such inquiries as were then possible into the circumstances attending accidents with explosives. His acquaintance with the circumstances and conditions which have led to the introduction of the Act, and his previous experience in the coal mining industry, with the application of explosives thereto, give an added value to his services with the division and to his assistance in the task now before us.

We were fortunate in obtaining the transfer from the Department of Militia and Defence of Dr. A. E. MacIntyre, to take up the appointment of Chief Explosives Chemist. To a thorough chemical training at the West of Scotland Technical College, Glasgow, and at the University of Jena, Dr. MacIntyre has added many years of study and research in the chemistry of explosives, combined with practical experience in the working of the Dominion Arsenals at Quebec and Lindsay—of which latter he was acting superintendent when transferred. I consider the division is particularly fortunate in having secured for this responsible post one in whom is combined to a rare degree the highest technical qualifications with an appreciation of what is practicable in the application of the teachings of the science of explosives.

To the chemical staff was added on June 23, Mr. G. B. Frost, B.A., formerly inspector and chemist in the Explosives Section of the Imperial Ministry of Munitions Inspection Department, in which capacity he showed his eminent fitness for the efficient conduct of duties as will involve on him in his present positions."

Preliminary to the formation of the Division it was necessary to visit the several provinces and to harmonize the work and regulations of the Division with the already existing statutory and mining regulations of the provinces.

The report deals with Orders-in-Council which have been issued at the instance of the Division governing the classification of explosives, the equipment and nature of explosive factories, explosive magazines, the storage of explosives in small quantities, the packing and conveyance of explosives, licensing of explosives manufacture, importation of explosives, facilities for testing, and tabulation and investigation of accidents originating in the use of explosives.

So far as the mining industry is concerned, the interesting part of the Report is the reference to facilities for testing explosives, this being the original necessity which led to the formation of the division and caused various mining bodies to advocate it.

In this connection the Report states:

"The analysis and tests which require to be carried out on an explosive to determine its suitability for classification as an 'authorised explosive,' are such as may be carried out in a well equipped laboratory, and as a temporary measure, the premises at the corner of Kent and Vittoria street have been secured, and will shortly be equipped in a manner that will suffice to meet our immediate requirements.

The examination of the large number of explosives which are now being made and which will come forward for test will impose an abnormal volume of work on the chemical staff at the commencement, and in order that the time necessarily taken in completing this will not interfere with the normal manufacture of, and trade in explosives made in Canada, it is proposed, except where there may be special reason to the contrary, and pending the completion of the tests, to provisionally authorize the explosives of Canadian manufacture in use.

The provision of equipment for a testing station in which the suitability of an explosive for use in coal mines may be determined is a larger question, and one which has been receiving careful consideration. Involved in it is that of the best design of the equipment to be obtained, and it is hoped that in a short time we may, in coming to a decision on this matter, have the benefit of a knowledge of the result of researches now in progress elsewhere. In any event, tests of the first importance will be those which will be carried out in a 'gallery' to determine the maximum charge of an explosive that can be detonated without igniting certain mixtures of gas and air, or causing a coal dust explosion, therein. Amongst others also will be tests designed to give a measure of the relative power of the explosives under examination.

As a result of tests of these natures those authorized explosives, which satisfactorily meet them would be put on the "permitted list" of explosives which may be used in coal mines. The composition of these explosives and the results of the essential tests will be published—although the composition and results of tests of authorized explosives not on a permitted list will be kept strictly confidential.

The establishment and equipment of a testing station for the tests of "permitted" explosives must of necessity take some time, and is an undertaking of vital importance. If one may anticipate a little, I may forecast that, apart from the conduct of routine tests, such a station should enable considerable ex-

perimental and research work to be carried on, which would be of value to manufacturers in their efforts to provide suitable explosives for use in mines, and, in furnishing both the manufacturing and the mining industries with helpful information, further fulfil its primary function of promoting the safety of the mine worker".

It will evidently be some time before Canada can issue its own list of "permitted" explosives, but it is gratifying to know that at last an organization has been formed and is actively working towards the preparation of a schedule of mine explosives that will accurately list their composition, the proper weight of charges, their behaviour in explosive mixtures, their ballistic properties, and other information which it is desirable should be at the disposal of mine managers.

Practically every notable coal mine explosion in Canada, and most of those in the United States, has had its proximate cause the flame and shock of some form of blasting powder or explosive, so that the necessity for accurate knowledge of the characteristics of explosives is beyond any question.

The Explosives Division of the Mines Branch has before it a lot of necessary and probably very hard work, and, while its formation is better late than never, it is impossible not to regret that the Division was not formed in 1910 when the Explosives Bill was introduced at Ottawa.

ATTEMPT TO UNIFY LABOR LEGISLATION Ottawa Conference Will Point Out Desirable Elements in Existing Laws

The various provincial and federal laws affecting labor will be considered by a delegation representing capital and labor, and the Government of each Province of the Dominion which will wait upon the Government at Ottawa in the near future, with a view to making the laws uniform for the whole country as far as possible, making due allowance for varying conditions. The attention of the federal authorities will be called to the variation in the provincial labor laws, affecting the Minimum Wage, Mothers' Pensions, Workmen's Compensation, Factories' Acts, Labor Bureaus, hours of labor, child labor, all legislation regarding arbitration and conciliation in labor disputes, and other matters affecting the workers of this country. It is hoped that as a result of this conference some agreement on necessary and desirable changes in the existing laws will be arrived at in order that the proposals may be submitted to the various Provincial Governments and the Federal Government for approval.

The Workmen's Compensation Act varies in important details for the different provinces. The Saskatchewan Act allows a workman compensation to the extent of 100 per cent of his wages during enforced idleness arising from injury. In Ontario only 55 per cent of the wages are allowed, and the amount differs in the other provinces. The Ontario Act contains clauses offering special benefits to the workmen which are absent from the other acts. It is the purpose of the meeting at Ottawa to select the best ideas from the different acts, and apply a uniform act as far as possible to the whole Dominion. All forms of labor legislation will be considered with a view to the selection of the best element of the different laws that would apply to the various provinces.

BRITISH CONTROL OF OIL RESOURCES

Sir E. Mackay Edgar, in explaining Great Britain's control of the oil resources of the world, says that within a few years the United States will be paying British oil interests \$1,000,000 annually for oil for the United States Navy and for home consumption.

"With the exception of Mexico and to a lesser extent, of Central America, the outer world is securely barricaded against United States invasion in force," he said. "There may be small, isolated sallies, but there can never be a massed attack. The British position is impregnable."

Sir Mackay declares that all known oil fields and all likely or probable oil fields outside the United States are in British hands or under British management or control, or financed by British Capital.

Great Harvest Certain

"We shall have to wait a few years before the full advantages of the situation begin to be reaped," he said, "but that that harvest eventually will be a great one there can be no manner of doubt. To the tune of many million pounds a year the United States before very long will have to purchase from British companies and to pay for in dollar currency, in progressively increasing proportion, the oil she cannot do without and is no longer able to furnish from her own stores."

"Apart from Mexico," Sir Mackay Edgar continues, "it is almost a case of the British first and the rest of the world nowhere. I should say two-thirds of the improved fields of Central and South America are in British hands. In Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Venezuela and Ecuador a decisive and overwhelming majority of petroleum concessions is held by British subjects, and will be developed by British capital. The Alves group, whose holdings encircle practically two-thirds of the Caribbean Sea, is wholly British, working under arrangements which insure that perpetual control of its undertakings shall remain in British hands."

Properties Widely Distributed

"No United States citizen and no United States group has acquired, or ever could acquire, any such position in Central America as that which enterprise and personality have secured for Mr. Alves, or take again that greatest of all oil organizations, the Shell group."

"It owns exclusive or controlled interests in every important oil field in the world—in the United States, Russia, Mexico, the Dutch East Indies, Roumania, Egypt, Venezuela, Trinidad, India, Ceylon, the Malay Straits, North and South China, Siam, the Starits Settlements and the Philippines."

Note:—

The foregoing news despatch may be quite true, but the judiciousness of this kind of propaganda is much to be doubted. It is quite unnecessarily provocative, and takes altogether too many things for granted. The "Sunday World" of London, in which Sir E. Mackay Edgar writes, is not a newspaper that commands a judicial audience, but it must puzzle even its readers to understand just what is feared from the United States, or what is to be understood by the phrase: "United States' Invasion in force." Are London journalists trying to emulate Mr. W. R. Hearst, or to find trouble for Sir Auckland Geddes? And have they forgotten the Argonne?—Ed.

Book Reviews

"MINERS' DISEASES." Record of the Researches of Dr. J. Court, of Staveley, England, into Miners' Nystagmus and Ankylostomiasis.

This little book was printed for private circulation, and is the record of the life's work of a medical man whose residence in a colliery district occasioned an interest in miners' diseases that has had results of definite value, particularly in diagnosis of the predisposing causes of miners' nystagmus, in recognition of which Dr. Court was recently knighted.

Dr. Simeon Snell, an eminent eye surgeon, and, shortly before his death, President of the British Medical Association, had propounded the theory that miners' nystagmus was caused by a strained position of the eye-ball of the miner in the operation of "holing" or undercutting the coal by the handpick. Dr. Snell's persistence in his theory, and his acknowledged eminence in his profession, for a good many years led to its general acceptance, but Dr. Court, as the result of painstaking researches pursued underground, and the examination of underground and surface workers of all grades employed in naked-light mines and in safety-lamp mines, obtained convincing evidence that nystagmus was the result of deficient and partial illumination, and that the steady growth in the number of cases reported was the result of the increasing substitution of the oil-flame safety-lamp for torches and candles. Later Dr. Court had the satisfaction of having his resources confirmed by an exhaustive investigation, carried out by Dr. Leonard Hill, under the direction of Dr. John Haldane of the Home Office, and the medical profession has now for some years ascribed nystagmus to defective illumination. The definiteness with which this fact has been established is in large measure due to Dr. Court's first-hand and early investigation of the matter under actual working conditions, and has had as a result the installation of electric hand-lamps in English collieries on a large scale in substitution for the oil-flame safety-lamp.

Confirmation of Dr. Court's researches is to be found in the appearance of miners' nystagmus in Nova Scotia since the general introduction of safety-lamps about 1904. Up to that time no cases of nystagmus had been recorded in Nova Scotian collieries.

Dr. Court has been good enough to state that he has found many nystagmus cases suffer from the glare of the white light of the electric lamp, and for their relief he has advised the use of light-amber coloured glass in front of the electric bulb, or the use of Crookes' glass. Very satisfactory results have been thus obtained.

Another ailment of miners to which Dr. Court directed early attention was Ankylostomiasis, a variety of what is known on this side the Atlantic at the hook-worm disease. A series of articles on this disease was contributed by the writer to the "Journal" shortly after its appearance in present form in 1907. The disease had only one outbreak in Britain, namely at the Dolcoath Tin Mine, and suitable precautions have so far kept it out of British collieries, although should conditions of deep mining and compulsory watering of the roadways ever bring about the necessary predisposing conditions of heat and moisture in British mines, its re-appearance might be anticipated.

Canadian collieries, in their present stage of development are usually too cold to breed this parasite, or, if they are hot, they are usually dry. The disease is undoubtedly present in the southern States, but so much is now known about the habits of the parasite, and the necessary precautionary measures are so elementary, that with due care, the "miners' worm disease", as it was termed in Europe, should be easily eradicated from any American mines in which it may have obtained entrance. Prophylactic measures are entirely those of ordinary sanitation.

Dr. Court is a representative of a fine school of men, namely, the "colliery doctor." Earlier in his career his theories seemed to conflict with the financial interests of colliery owners, and were used to some extent by miners' leaders to oppose the introduction of safety lamps. He has had the pleasure of seeing his work commended by both miner and coal-owner, as the result of a painstaking and undeviating search for facts, and in this fashion has earned that recognition which is the crowning reward of the scientist. —Ed.

FATIGUE OF THE VISUAL ORGANS IN COAL MINERS: (La Fatigue de l'Appareil visuel, chez les Ouvriers Mineurs). By Dr. M. Stassen, Liege, Belgium.

Dr. Stassen's volume reviews the history of miners' nystagmus, describes the conditions of work underground, and assembles the conclusions indicated by statistics obtained during a comprehensive survey which comprise all the mines in the Province of Liege, and all the cases coming under observation of the nystagmus clinic at Mines Hospital at Liège. Dr. Stassen undertakes as the result of his investigations to establish the cause of miners' nystagmus—a disease of which the most prominent symptom is oscillation of the eyeballs—as *the result of a pronounced fatigue of the entire apparatus of vision*. He examines also the connection of nystagmus with the occurrence of accidents at work. The preventative and curative measures to be adopted are discussed, and also the principle of workmen's compensation in cases of nystagmus.

Medical writers on nystagmus have been sharply divided into two schools, namely, those who ascribed the cause of the disease to a strained position of the eyeballs at work, and those who attributed it to a deficiency of illumination and the fatigue arising from an attempt to see in the dark. The supporters of these two viewpoints are found in Britain, Belgium, France and Germany, and Dr. Stassen reviews with authority and in an interesting manner the progress of the medical literature on the subject. The large amount of attention given to this disease by British authorities is evident from the bibliography and the nomenclature associated with the disease.

Dr. Stassen discusses at great length the conditions of the coal miners' work, which he has observed under actual conditions, having, as he says, many times followed the miner from the daylight to the working place and back again. His studies have convinced him that *the work of a coal-miner imposes upon his visual organs a general fatigue, such as no other profession is exposed to*.

The miner descends in the cage, his eyes being adapted to the sunlight; the pupils, the visual ac-

commodation, and also the pressure upon the labyrinth of the ear being such as required by the atmospheric pressure and light conditions of the surface. In descending the shaft all these change abruptly, setting up reactions that irritate and tire the visual apparatus, and the nerve centres of both eye and ear, which are particularly to be observed in collieries having deep shafts with rapid hoisting time. Further adjustments of the visual apparatus are necessary before proceeding to the working place, known to miners as "getting the eyesight." The illumination underground is insufficient to enable the miner to distinguish objects clearly, and the visual apparatus is again strained in the endeavour to use the adaptation powers of the eye to their fullest and to an unnatural extent. During a prolonged stay underground the glare and the flickering of the miners' lamp exert a further irritating effect, and rapid changes are needed to regulate the admission of light to the retina. In coming out of the mine, into the daylight, reverse adaptations of the visual apparatus and the inner ear are caused. Dr. Stassen names many other circumstances of the miners' work that he considers to be the source of fatigue of the visual apparatus, but generally, he appears to prove that it is not one circumstance, but a combination of many, that causes nystagmus. All the causes, however, seemed to be included in the conditions of deficient illumination obtaining in coal-mines underground.

Dr. Stassen states that after examining many miners, suffering from varying forms of eye-trouble, by a process of elimination, he has found but one cause of nystagmus, and consequently but one mode of amelioration, namely, *that a sufficient and necessary cause of nystagmus is the deficient condition of coal mine illumination.*

The standard types of miners' lamps, oil and spirit-flame safety-lamps, and electric lamps, are discussed at length as to their effect upon the causes of nystagmus.

Dr. Stassen finds that nystagmus tends to increase the number of accidents, to lessen the value of men as workers; and he also finds that accidents to men afflicted with nystagmus intensify the trouble under certain conditions. He denies, however, that nystagmus can ever be a traumatic consequence of injuries, but is essentially "a professional malady, engendered by an accumulation of causes of irritation and fatigue of the eyes occasioned by bad conditions of lighting."

Prevention of nystagmus is possible only in one way, namely, by the improvement of the illumination underground. Not only should the amount of illumination be greater, but its diffusion must be improved, and the light provided should be steady, without glare and shadows as far as possible. The use of suitably tinted glass, or glass with a ground or "mat" surface, is recommended. Good results have been obtained at the Hasard Collieries in Belgium by glasses tinted a yellowish-green.

Dr. Stassen mentions that his investigations and the proposals for ameliorating lighting conditions in Belgian collieries, were interrupted by the war, but will be immediately resumed. This is a typical instance of Belgian fortitude, and calls to mind that in Liège many additions have been made to the world's knowledge of how to combat the dangers of the coal mine.

COST OF MINING BITUMINOUS COAL IN THE UNITED STATES.

Figures for January 1920.

Reports received by the Federal Trade Commission from 1,589 bituminous operators in various parts of the country, covering the month of January, show that the average cost of production in that month was \$2.32 per net ton. This compares with an average of \$2.04 for the year 1918.

The figures do not include interest, selling expense tax and certain other items which enter into the cost of mining and marketing soft coal.

Of the total production cost per ton in January by far the largest item was labor, amounting to \$1.74, as compared with \$1.49 in 1918. The largest production cost reported—\$3.52—was in Arkansas.

The increase in the average cost of production in 1920 as compared with 1918, the statement said, was attributable to two causes—the higher wage scale put in effect in November, 1919, and a small decrease in the January output as compared with the monthly average in 1918.

The average sales prices for January was \$2.78 per ton, as compared with \$2.60 in 1918, in the case of 1,272 identical companies. This gave a gross margin of 46 cents a ton in January, as against 56 in 1918, from which selling expense, interest, excess profits tax and other charges not included in cost of production, as reported, must be deducted to give the operators' net profit.

The reports were submitted in response to the Federal Trade Commission's order of January 31, which the Supreme Court of the District of Columbia has decided is not enforceable.

Average cost of production, per ton, in various bituminous districts during the month of January, 1920, is reported as follows by the Federal Trade:

ILLINOIS.

District No. 1	\$2.84
District No. 2	2.19
District No. 3	1.98
District No. 4	1.84
District No. 5	2.45
District No. 6	2.09

INDIANA.

District No. 1	2.07
Brazil Block	2.68

MARYLAND.

Average for State	2.60
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OHIO.

District No. 1	2.82
District No. 2	2.51
District No. 3	2.08
District No. 3a	2.03
District No. 4	2.37
District No. 5	2.54
District No. 6	3.15
District No. 7	2.76
District No. 8	2.12
District No. 9	2.13

PENNSYLVANIA.

Southwest District	2.22
Central District	2.49

WEST VIRGINIA.

Pocahontas	1.98
Tug River	2.58
Thacker	2.35
Kenova	2.84
Logan	2.10
New River	2.63
Kanawha	2.23
Putnam County	3.45
Coal and Coke and Gauley	2.36
Fairmont	2.43
Pittsburgh Seam District	2.12

IMPROVEMENT IN WATER-SPRAYING DEVICE FOR HUMIDIFYING MINE AIR

Considerable interest attaches to the "Daniel Wakall" improved water blast, an appliance designed by Mr. J. Daniel, of the Government Mining Areas Company, on the Eastern Rand, for the purpose of better allaying dust and deleterious gases in mine air, by utilizing water under pressure causing it to split into fine particles by striking solid surfaces, and subsequently atomized by compressed air. The device consists of an outer shell or casing, fitted internally with a plug valve, with two passages, one for the airway and the other for the water. In the air passage a non-return ball valve is placed. The airway connects with a cylindrical sleeve admitting the compressed air to an inner chamber through slots at the back end. Within the chamber is fixed and air regulating spindles, with cone-shaped face, forming a valve with the inner front head cone surface of the sleeve, acting as a valve seat. The extension of the spindle beyond the valve face it a distributing cone. The water passage connects with an annular chamber surrounding the front head of the sleeve, which has a cone face forming a valve with the outer casing as a valve seat. The screwed spindle is rotated within the sleeve, and the screwed sleeve carrying the spindle rotates with the casing. The plug valve is operated by a removable key.

The functions of the device are as follows:—Compressed air and water under pressure are connected to the device by the usual pipe fittings. The key operating the plug valve is rotated through a quarter of a turn, admitting the air and water into their respective chambers. The screwed sleeve is rotated back to form the required aperture between the casing and the sleeve to determine the quantity of water used. The spindle is similarly adjusted within the sleeve, controlling the quantity of air used. The water under pressure issues from the chamber in a cone-shaped jet, and, striking the spindle, is split into fine particles. The compressed air issuing from the centre behind the water immediately projects the fine particles of water on to the head of the spindle, which deflects the atomized water into a cone-shaped stream, the degree of atomization being controlled by the adjustable apertures of both the air and water. The non-return valve placed in the air passage of the plug is to prevent the back pressure of water entering the com-

pressed air mains when the air pressure fails, or, for economic saving, is cut off after the blast has been in operation for a certain length of time. The removable key operating the plug valve can only be separated from the casing when the blast is turned full on. As the device is placed in direct connection with the air and water services, without any intermediate valves between the mains and the devices, the return of the key to an official is a direct proof that the water blast has been put into operation. The claims for the device are as follows:—(1) The adjustable sleeve regulating the quantity of water used. (2) The adaptability for clearing the water aperture in the event of its being choked, by rotating the screwed sleeve in the casing and flushing the aperture clear. (3) The regulating spindle allowing any quantity of compressed air to pass. (4) Any desired combination of quantities of air and water producing every degree of atomization from a dry fog to the state in which the particles of water rapidly fall out of suspension. (5) The retaining valve in the air falls to atmospheric pressure, thereby ensuring the inability of any back water pressure entering the air mains. (6) The inability to remove the key except when the water blast is in operation.

THE HUFF ELECTROSTATIC SEPARATOR.

At the recent meeting of the American Electrochemical Society in Boston, opportunity was given to the members to visit the testing and demonstration plant of the Huff Electrostatic Separator Company at Arlington Heights, near Boston. The Huff separator uses electric current of high voltage and low amperage to separate mixtures of dry materials having different electrical conductivities, either by repelling part of the material vigorously, or allowing part of the material to be electrically released more quickly than the rest when passed over an electrode.

Some of the materials shown to the visitors in original form, and as concentrates and tailings, included garnetiferous sands, fine anthracite coal mixed with sand and dirt, graphite ore, micaceous rocks, molybdenite ore, abrasives, aluminum slag, barytes and lead ore, and, amongst other things a mixture of ground automobile tires separated into rubber and cotton particles.

While the electrostatic separation process has admitted limitations there would appear to be a wide field for its use because of the exactness and nicety of the separation, the small and inexpensive plant required, and the comparatively small power cost. For the separation of graphite the process seems excellently well adapted, as a comparison of the flaky and unctuous-feeling product of electric separation with Ceylon "chip" revealed. For separation of minerals contained in sands the process is well adapted, as it is also for the separation of abrasives from sands, or form the dross of artificial abrasive manufacture.

The usefulness of this method of separation in connection with any given natural or artificial mixture of materials cannot be determined with any exactness except by actual testing, but trial with a small sample will enable an opinion to be given as to the suitability of the method in each case, and the Huff Company state it has not been required to dismantle, as yet, any plant which was recommended for ore-dressing by its engineers as the result of tests.

PROBLEMS OF PROSPECTING AND STAKING IN THE YUKON.

Progress is being experienced in the field of prospecting as well as in all other fields of human endeavor. The world stands still in no respect.

Time was when prospecting was confined to the picturesque individual who roamed the hills and vales with pick, shovel and pan. He served his day well, and to a large degree his kind have yet a large field and a large service to render the world. While recognizing his economic position in the mining world of yesterday and of today, recognition also must be given to the fact that a new form of prospecting has come into vogue with the innovation of modern mining equipment the last few years.

The new equipment has made it possible to work properties of low grade which the earlier individual miner could not touch. Wholesale methods are now contrasted with those of the individual sphere. Any business conducted on a vast scale reduces costs to the minimum and brings within workable range many low grade propositions which are thus made to yield their wealth to the world.

Keystone drills, diamond drills, and other new methods of testing make it possible to sink and determine values accurately now on ground which years ago could not have been touched. Dredges, hydraulics and other big operating equipment and, in the Arctic, the new cold water thawing process have brought grounds which formerly were considered hopelessly low grade into the desirable range. On the vast low grade areas, however, the individual operator is not prepared to proceed. A number of individuals must band themselves together in order to combine their financial strength to make it large enough to acquire capital to obtain the necessary equipment. When they do so they become co-operative prospectors and miners, or in other instances may be denominated companies.

Where the individual would have to leave large areas untouched, the company or co-operative mining enterprise can proceed. When such low grade grounds are made productive, the company is not alone the beneficiary. Operation of low grade properties first calls for labor. The first earnings of a mining company go into labor. That is the first dividend from the enterprise. The law recognizes the bill of the laborer or worker for service as the first that must be paid.

Large companies operating in the Yukon the last twelve years have taken millions from the ground which could not have been extracted profitably by individuals. Had there not been a way provided for the large concerns to handle this low grade property on the large scale on which they did work, Klondike would have been a dead camp years ago. Millions of yards of auriferous gravel have been turned over by dredges and hydraulics on which individuals had to cease operations prior to the coming of the gold ships.

Now the gold ships have worked out scores of miles of placers of known dredge values in Dawson and vicinity. One company's fleet already has been reduced from nine to only two working dredges for this season. That company will ship the dredges from the camp if it does not obtain new ground of workable values. Some of its dredges already have gone. Another is to leave Iditarod this season, and work of dismantling it will begin at once. When the dredges leave, the pay rolls diminish and men no longer reap

any returns from ground which is too low grade for individual operation.

It appears there are many low grade properties in the territory which under the cold water thawing should prove profitable to work. Dredge companies now want, it seems, to test some of those tracts, and, if proved satisfactory, start operation on them.

The proposition has been advanced that five-mile tracts be allowed to be staked by large companies and that they first be permitted to prospect the tracts. It would be a shame for any large company to get privilege to close any virgin creek carrying original values in the garden spots such as Eldorado, Bonanza, Hunker and similar Klondike creeks, and no steps should be taken which would thus deprive the individual in any such possible new field. And it is to be hoped every precaution will be taken against such contingency arising.

On the other hand, it would be a poor business to drive dredges from this region because the people willing to test low grade ground could not have the opportunity. It is well known that in the past some large concerns tried to acquire good sized tracts by individual staking, and that parlor prospectors and chair-warmers staked claims here and there in the tracts with hopes of getting good prices. They did not stake the ground until the large companies started to prospect or move in that direction, and after the large companies moved off the individuals in most, if not every instance, moved away.

It also is to be remembered that on some of the creeks in this territory practically hold-up methods blocked some of the largest dredge operations of this camp, and that several miles of good placers on two or more creeks where dredges attempted to undertake work now lie idle because one or two individuals on each of those creeks intervening with small strips of ground.

The hold-up staker and the parlor prospector have been quite as much of a detriment to the pay roll and production totals of this camp as the concessionaire who held the ground from the individual operator. Both deserve the condemnation of this camp. The genuine prospector who gets into the hills, the man who punches the hills and valleys full of holes, the big companies willing to risk their investments in order to open this country and create employment, all deserve encouragement.

Surely Yukon is going to do her best to find the solution for keeping the old-time individual mining going in every suitable district and the new class, modern large operations, also humming.

Where there is a will there is a way.—Dawson Weekly News.

METAL QUOTATIONS.

Fair prices for ingot metals, Montreal, 27 April.

	Cents per pound.
Electro Copper	24
Casting Copper	23½
Lead	10¾
Zinc	11
Tin	72½
Antimony	13
Aluminum	40

Nova Scotia Notes

Dominion Coal Company to re-open Morien Colliery.

The decision of the Dominion Coal Company to re-open the Morien district for coal production has been a foregone conclusion for some time. Mining operations in this locality have witnessed many vicissitudes although time was when Morien was the business place in Cape Breton, and in the front rank as a coal producer. As the successor to the Boston and Morien Coal Company, which in its turn succeeded the Gowrie and Blockhouse Company, the Dominion Coal Company became possessed of the very extensive submarine field of the Morien Basin, and by purchase from the Cumberland Railway and Coal Company the Dominion Steel Company acquired the land areas of the basin, which were later turned over to the Dominion Coal Company, who in 1911 opened the collieries now known as Nos. 21 and 22, designed to extract a tongue-shaped area of shallow coal which is the remnant of the rather sharp synclinal basin that finds its apex about five miles inland from Morien, and extends seawards in a fan-shaped extension.

It is interesting to note that Mr. Belloni, a pioneer coal operator in Cape Breton, who formerly operated the Blockhouse Seam at Morien, is still alive and in good health in New York.

The Dominion Coal Company owns a branch line to Morien, connecting with the Sydney and Louisburg Railway, and for some time has run workmen's and passenger trains enabling some of the workmen at Collieries Nos. 21 and 22 to reside at Morien in the colliery houses there.

When the Morien Colliery was operated by the Gowrie and Blockhouse Colliery, vessels were loaded by means of an aerial conveyor which connected with a loading pier standing out in deep water in the Bay. This arrangement has long been dismantled, and will not of course be used again, as there is now rail connection.

Between Morien Basin and the Glace Bay Basin lies in the course of a pronounced anticlinal ridge which can be traced by the folded and broken outcrop of the Millstone Grit across country to the neighborhood of Sydney. Presumably a wide tract of barren rock intervenes between the seaward continuation of the Glace Bay and Morien Basins, but under the waters of Morien Bay itself it may be expected that a large body of workable submarine coal exists. The identity of the Morien seams with relation to those of the Glace Bay side is not determined, but it is surmised that the Blockhouse Seam at Morien is the equivalent of the Hub Seam at Glace Bay.

Manitoba Letter

By Chas. A. Millican, Winnipeg.

One thousand pounds of ore, taken with a view of having a fair sample, so that a reasonably accurate and representative assay value could be obtained was shipped recently from the Bingo Mine to Ottawa. Mr. Myers has received word that this sample has produced at the rate of four and one fifth ounces of gold or about \$100.00 per ton at present values. Mr. Myers expresses great satisfaction at this return. He expects to have a Mill run of from 30 to 40 tons early this summer run through the Mill on the Rex property, which adjoins.

Extensive underground work is being undertaken on the Rex Mine this year. Towards the latter part of the season the Company intends to treat all rock taken out. The Mill has a capacity of 80 tons per day.

Over one hundred men are engaged on preliminary work on the Flin Flon Mines and \$85,000 has already been spent for machinery. Work is being rushed ahead. The Longyear Co. of Chicago has the contract for sinking on two shafts and are reported to be making good progress.

A regular air passenger and parcel freight service is to be established during the coming summer between Winnipeg and the Rice Lake gold fields by one or more of the Winnipeg Aviation Companies. The Winnipeg Aireo, Limited, are contemplating taking moving pictures from the air of all mining camps, water routes and other transportation channels. The present intentions are to have these pictures exhibited locally in connection with the Province's natural resources, and later, released in other parts of the Dominion. The Aireo Company's aerodrome is located at River Park, Winnipeg.

The matter of Provincial police protection in the different mining areas will receive the attention of the Provincial police Commissioner. Heretofore there has been a sad lack of proper protection for those camps may have been temporarily idle, and the unwritten miners' laws that usually prevail in mining camps have been, on several occasions, very severely offended against. It is hoped that, from now on, miners and prospectors may feel a greater sense of security in these districts.

Incorporation has been granted by the Provincial Government to Angus McDonald Mines, Limited (Non Personal Liability), a mining concern with an authorized capitalization of \$3,000,000. Provisional directors named in the charter are: Frank M. Ruggles, broker; William Martin, Jr., broker; G. C. McTavish, barrister, and others.

The head office of the company is to be in Winnipeg and powers granted the company are wide enough to permit it to enter into any kind of business connected with mining, development, brokerage or otherwise for the flotation of companies.

The division of the stock is to be 600,000 shares at \$5.00 each.

SOVEREIGN PROFITS \$16,872

Annual Meeting of the Company Shows Satisfactory years Operations.

At the annual meeting of the shareholders of the Sovereign Porcupine Mines, Limited, held in Toronto on April 22nd, the financial statement showed that during the period ending January 31st, 1920, \$16,872.43 was expended in exploration and development. President Moodie, in his address to the shareholders, stated that over 4,000 feet of diamond drilling was carried out on the company's property, which lies adjacent to the Hollinger Consolidated. Mr. Moodie also stated that the operations on the north claim were discontinued owing to the existence of forest fires and work transferred to the south claims, where a considerable amount of trenching and stripping was carried on, with the result that an excellent vein, heavily mineralized, was uncovered.

Northern Ontario Letter

THE SILVER MINES.

The fourth week of April will be remembered in Northern Ontario, particularly in the precious metal mining areas, as marking the commencement of the turn in the tide of the post-war readjustment of economic conditions. The ticker all week carried a message of uneasiness in the stocks of the big industrial concerns, which have literally wallowed in prosperity since the late war began. At times, quotations for these shares declined almost precipitately, thus reflecting the fact that they may now be entering upon a period of re-adjustment to normal, and that the voyage from artificial prosperity to normal may not be altogether smooth sailing.

In the North, actual enthusiasm has been manifest. Precious metal is in great demand. The difficulty has been that it has cost a lot to produce it. The messages from the south which tell of the downward movement in the industrial stocks, as well as an actual break in the price of provisions, including corn, pork, etc., carry hints at least of cheaper material, and offer some promise of actual curtailment of work in many centres to the end that men must seek employment elsewhere. It is here, that the belief is entertained that the exodus from centres of industry created by war's necessity will be to the centres of such basic industry as the precious metal mines of Northern Ontario.

Meanwhile, the quotation for commercial bar silver remains at a figure well above the average for any previous year in the North's history, while as is well-known, the price of gold must inevitably remain unchanged—it is the standard of value, the yardstick of the monetary status of the nations.

The embargo on freight between Canada and the United States has caused a temporary curtailment of ore shipments across the border. Much of the ore which ordinarily goes to smelters in the States to be treated, is being held in Cobalt. In the meantime, however, no serious consequences result, for the reason that the greater volume of the ore is treated in Canada, and that going to the United States is but a certain class of ore of small quantity which is found difficult to treat, and its deferred shipment does not interfere in any way with the operations of the mines.

Bullion stored at the mines is believed now to amount to more than at any previous time in the camp's history. It is thought, however, that the delay in the expected upward trend in prices may cause at least a limited quantity of this bullion to be marketed at a reasonably early date.

According to an official statement, the Chambers-Ferland mine of the Aladdin-Cobalt Company, shipped ore steadily during the month of March to the Dominion Reduction plant for treatment, and realized a comparatively large net profit. The average content of the ore approximated 20 ounces of silver to the ton. Shipments are continuing during April at the rate of between 30 and 40 tons daily. In the meantime, underground work is being centered on a new ore shoot in a vein which appears to bear relation to the old vein No. 15. This ore shoot is stated to be about four inches in width and has been drifted on for upwards of fifty feet, showing values ranging from \$5 to \$4,000 to the ton.

At the annual meeting of the Trethewey-Cobalt Company, it was stated that the Castle property of the

Trethewey, in Gowganda, had produced upwards of \$50,000 to date, this amount having been contained in two shipments sent out since the beginning of the year. Another shipment is forecasted for late June. Some \$40,000 was produced from a drift just 70 feet long at the 100-ft. level, at which point some 250 feet of drifting has been done. A prosperous future is predicted by the manager, I. S. McReavy.

An unofficial report in Cobalt intimates that Stuart M. Thorne, who was manager of the Trethewey prior to enlisting for overseas service during the late war, will again resume his former duties, it having been generally understood that he would be re-instated immediately after his return from overseas. Concerning Mr. McReavy, it is general knowledge that his work at the Trethewey mine has been highly efficient, and that as a result of his two year's of activity in the Cobalt camp he has been singled out as perhaps one of the most successful of the rising young engineers.

The Mining Corporation of Canada is stated to have decided to take up bonds which it recently obtained on the Yankee Girl mine in Ymir, B.C. It is stated that instructions have been issued to prepare the mine for operation, the sum involved being estimated at \$400,000.

Proposed amendments to the Mines Act of Ontario are having a more or less rough passage through the Ontario House, at least in the case of the proposal to alter the schedule of recording fees. The Minister of Mines is endeavoring to change the recording fee from \$10 to \$5 for each claim staked and recorded by a license holder for himself, but would increase the fee from \$10 to \$15 in the case of where one license holder stakes claims on behalf of another license holder. The contention is being put forward by prospectors that such an alteration would be harmful to the mining industry. It is pointed out that the great majority of prospectors in the field are kept active through being grub-staked by business men and mine workers, the prospectors agreeing to stake claims on behalf of those grub-staking them. It is also shown that as was the case with such mines as the Hollinger Consolidated and the Dome Mines, they were located by prospectors working on a grub stake arrangement. It is thought that although the bill has passed its second reading, the above proposed alteration of fees will be omitted before it is given its third reading. As regards the other amendments, they appear to have met with fairly general favor.

Robt. Lyman, manger of the Seneca Superior mine at the time of its successful and spectacular career, has secured a lease on the Rochester mine and proposed to carry out a comprehensive development campaign. Work, when commenced, will be carried on through the shaft of the adjoining Lumsden mine.

At the Oxford-Cobalt property the work of development is well under way. The contractors are at work on the shaft which is being driven from surface to the 200-ft. level. At the time of writing, the shaft is down 20 feet. Two machines are employed.

Authentic information received today is to the effect that the formation of the Bailey Silver Mines having been completed, and with the Bailey mine officially estimated to contain upwards of half a million ounces of silver ore in sight, arrangements have been made to commence work at once, and that by June it is hoped to have a carload of high grade ore ready for shipment.

The Bailey Silver Mines was formed for the purpose of purchasing the old Bailey-Cobalt Mine as well as the plant of the Northern Customs Concentrator, both purchases of which have now been completed, the above mentioned concentrator to now be known as the Bailey Mill.

Ore at the Bailey is estimated to amount to 23,186 tons containing 510,294 ounces of silver, which consists of actually developed ore, and does not take into account that contained in the dumps, and in further probable ore in the mine. The property, though closed down on account of litigation since 1914 is regarded as one with a big future. In addition to this, it is stated that the concentrator taken over is making net profits at the rate of \$75,000 a year from customs work done for other companies.

Directors of the new company include the following: A. J. Young, of Toronto, is president; Alex. Fasken, Toronto, Treasurer; and J. R. Booth, of Ottawa, Vice-President, with F. J. Bourne as General Manager.

Ore and Bullion Shipments.

During the week ended April 23rd, three Cobalt companies shipped an aggregate of seven cars containing close to half a million pounds of ore, the Mining Corporation being the heaviest shipper, with one car a day, as announced in advance recently in these columns.

Following is a summary:

Shipper.	Cars.	Pounds.
Mining Corporation	5	345,909
La Rose.	1	84,660
O'Brien.	1	60,075
Total	7	496,644

During the corresponding period, the Mining Corporation sent out 99 bars containing 100,004.90 fine ounces of silver bullion. This is the first heavy shipment of bullion to go out in several weeks, the tendency being to hoard up the output with the expectation of another upward move in quotations for the metal.

THE GOLD MINES

The gold miners' view with equanimity the gyrations of quotations for shares in the big industrial concerns in the more thickly populated centres to the south. The general impression exists that the present is the beginning of the post-war era of readjustment which is to spell for the gold mining industry perhaps the most prosperous period in history.

The important announcement is made this week officially to the Canadian Mining Journal correspondent that the Cassel Cyanide Company of Glasgow has made application for the incorporation, under Dominion and Provincial charters, of a company to be called the "Cassel Cyanide Company of Canada, Limited," to handle the Canadian business of the Cassel Cyanide Company, of Glasgow, Scotland. The directors of the Canadian company will be Sir George Beilby, F.R.S., Glasgow; Colonel Sir Edward Allen Brotherton, of Bart, M.P. for Leeds; William Neill, Glasgow; Rupert G. Bruce Toronto; Major Fred A. Peacock, Montreal, and William Evan Simpson, Boston Creek. It is proposed to establish head office in

Montreal, and to have Northern Ontario headquarters located at Timmins, in the Porcupine gold district.

It is unofficially reported that the Hayden-Porcupine mine may resume work this year on a large scale. The property is situated in the township of Ogden, some three or four miles south from the Hollinger mine. In the period prior to the shortage of labor caused by the war the property was explored in a fairly big way, and the developments are stated to have been sufficiently encouraging to warrant continued work.

The Hollinger, McIntyre and Dome, as well as the Porcupine Crown all continue to work on a fairly uniform scale, with indications of conditions improving gradually. It is thought that the improvement taking place will be found to be permanent, and that the end of this year will witness all the producers working at full capacity.

During March, the Lake Shore mine at Kirkland Lake, produced \$45,133.18, making a total of \$130,687.92 for the first quarter of the year, or at the rate of well over half a million dollars a year. The total output from this mine in its as yet, short career amounts to \$809,271.97. Mill heads have averaged approximately \$25 a ton for every ton of ore handled since the mill started operation, thus winning for the mine the reputation of being the highest grade gold mine among the important gold producers in Canada.

With the Lake Shore setting such a pace, and with the Kirkland Lake Gold Mines now also said to be producing value in excess of costs, the gold mining industry of Kirkland Lake is steadily taking on added importance. In addition to this is the actual construction of the large Wright-Hargreave mill now under way with the likelihood of the Tough-Oakes mine resuming work next month. Added to this, also, are a number of other important properties where work is resulting favorable. These include the Ontario-Kirkland where the shaft is now being driven from the 300-ft. to the 450-ft. level, and where considerable commercial ore has been developed. Another is the Bidgood where the work of sinking a central shaft from surface to a depth of 300 feet is now underway.

At Boston Creek the Miller Independence Mines has turned on electric power and is now in a position to carry out its big development programme with the maximum of speed. While cross-cutting is being done at the 500-ft. level to open up the downward continuation of the main orebody, work is also being done in the incline shaft along the rich deposit known to occur there. Specimens of ore sent from the Independence to the Toronto University were found to contain "calverite," as in these columns from time to time. Confirmation of the occurrence of this, the highest grade gold telluride known is regarded as being significant, in that it occurs in such spectacular quantities.

Prospectors just in from the Skead township district declare that the prospectors and miners in that district have commenced the work of cutting a road to the railway by way of Boston Creek. Failure of the government to grant the assistance has resulted in the property owners themselves taking the matter up. It is still hoped to induce the government to finance the construction of a bridge over the Blanche river. The distance to the railway over this route is only about twelve miles as compared with some 25 miles over the old road to Englehart.

British Columbia Letter

Alice Arm, B. C.

A tunnel that has been driven on the Muskateer Mineral Claims by A. McGuire for J. D. Meenach, of Seattle, Wn. It is reported that this work disclosed some high-class ore.

Satisfactory results are said to have been obtained by the diamond drilling which has been in progress on the Tiger Group for some time.

Prince Rupert, B. C.

Attention has been drawn by the Prince Rupert Board of Trade to the limonite ore deposit of the Copper River District situated near Copper City and in proximity to the city of Prince Rupert. In this connection reference is made to the coal fields of that locality, it being claimed that these contain the finest coking coal of the Province. The business men of Prince Rupert fear that the Provincial Government and individuals or corporations, in their investigations of the iron and steel possibilities of British Columbia will overlook that these resources, together with "water powers and all necessary fluxes," are to be found in the northern section of the Province.

Princeton, B. C.

The Horn Silver Mining Co., situated in the Similkameen District, is operating again after a period of idleness, weekly shipments of from 45 to 50 tons being sent to the Tacoma (Wn.) Smelter. The lessees are working on a vein varying in width from eighteen inches to six feet, the ore of which contains considerable gold and silver values. An aerial tramway carried the ore from the mine to the bunkers whence it is transported by wagon to the railway.

Grand Forks, B. C.

It has been officially announced that the Granby Consolidated Mining and Smelting Co. will dismantle its mine plant at Phoenix, where the mines have been idle for some months. Those parts that can be used either at the Company's collieries, Cassidy, Vancouver Islands, or at the copper smelter, Anyox, will be shipped. Some sections will be disposed of on the ground and the remainder will be stored at the Grand Forks Smelter. Not since the mines of Phoenix ceased to be worked last June have the people of the district given up hope of seeing them resume operation. Authorities have given it as their opinion that there are 3,000,000 tons of ore available still, of which several thousand tons is of good grade. The establishment of a concentrator for the treatment of the remainder has been talked of but the plan clearly now has been abandoned. Phoenix thus will become one of those phantom mining towns not infrequently found in mining sections of the American continent. Its streets, its houses, and its places of business will continue practically deserted and no longer will the clear mountain air of what was the town of greatest altitude in British Columbia re-echo the clang of industrial activity. The Phoenix properties were opened more than twenty years ago during which time there have been shipped about 13,000,000 tons of ore to the Grand Forks Smelter, which ore is estimated to have had a gross value of about \$56,000,000.

Rossland, B. C.

The surface equipment of the White Bear Mine was destroyed by fire recently. Flames first were seen bursting from the compressor house. This soon was wiped out after which the mine shaft and some un-

occupied houses were reduced to ruins. The transformer house was saved by packing snow about it.

Slocan City.

That a stringer of ore has been opened up on the fifth level of the Ottawa Mine, near Slocan City, which assays from 800 to 3,000 ounces of silver per ton, is the effect of a report from this camp. The showing was observed during the cleaning out of a drift and it was thought that it contained about a sack of ore. Development, however, appears to have disproved this as 10 cars already have been taken out and what is now referred to as "one-sack slope" has been exposed for 20 feet with a width up to 18 inches.

Trail, B. C.

The British Columbia town of Trail, smelter centre of the Consolidated Mining and Smelting Company of Canada, proposes introducing daylight saving this summer without regard to what action may be decided upon elsewhere. The Company's clocks were set ahead an hour at midnight on the 15th of April. Employees in and around the smelter expressed a preference for this arrangement and the management acquiesced.

Ore receipts at the Trail Smelter for the week, April 1st-7th inclusive, were 4,588 tons, making the total for the year to date 77,834 tons. The independent shippers were the Donohus, Nicola, 35 tons; the Emerald, Salmo, 41; the Josie, Rossland, 172; the North Star, Kimberley, 86; the Ptarmigan, Athlamer, 25; and the Spokane Trinket, Ainsworth, 46. The Sullivan Mine, Kimberland, contributed 3,978 tons of zinc and 205 tons of lead ore.

Victoria, B. C.

When Hon. D. T. Pattullo, Minister of Lands in the Provincial Government, asked the Provincial Legislature to endorse a vote of \$25,000 to continue the investigations inaugurated last year by Prof. Gwillims into the oil possibilities of the Peace River District of British Columbia he stated that the explorations up to date encouraged the belief that oil would be found in quantities in this section. The government's policy, he asserted, was to see that this oil wealth, if it existed, should accrue to the whole people. A reserve had been declared on oil on the crown lands of that district and if oil was discovered the government would consider the advisability of itself going into the oil producing business, using the profits to pay off the provincial debt. The vote was passed although several private members expressed the belief that private enterprise would make a more thorough exploration and that it would be the wiser policy to let those wishing to do so to undertake the work, it being understood that a royalty would be payable to the government on anything that might be discovered.

The Minister of Justice, Ottawa, has announced that there would be no disallowance of the Dolly Varden Act of the British Columbia Legislature under the terms of which the Taylor Mining Co. acquired possession of the Dolly Varden Mine, Alice Arm, certain mining equipment, and a line of railway from tide-water to the property, the latter at the time of the change of ownership being within a short distance of completion.

Immediately this information was received R. T. Elliott, K.C., legal representative of the original Dolly Varden Mines Company, took the necessary steps to have the validity of the Provincial Legislation, and the title of the Taylor Mining Company to the property, tested in the British Columbia courts.

Mr. Elliott has issued two writs, one asking for a series of declarations setting aside the Act and all proceedings taken under its provisions and the other asking for damages for alleged trespass and for payment to the plaintiff of all money realized from ores produced at that Mine.

The Ward-Hopp litigation, a struggle for possession of the Bullion Mine Property which was carried through all Canadian Courts and even to the Privy Council of the Empire, is nearing its finish. R. T. Ward and his associates have been declared the winners of this long-drawn out legal battle and now there is before the Provincial Legislature a special Bill, entitled the "Cariboo Hydraulic Mining Company Amendment Act, 1920" which renews and extends for a period of thirty years the placer leases of the Company. Mr. Ward, however, evidently has not seen the last of his legal troubles for, as soon as the Legislative Assembly re-establishes the Company's title to the property, he must defend himself in court against an application made by a group of his associates for his dismissal from the position of trustee of the Bullion Mine and for a declaration by the judge of the respective interests of Messrs. Ward et al in the property.

Vancouver, B. C.

There is still hope that the Dominion Government will establish the long promised Ore Testing Plant in British Columbia. Some years ago \$300,000 was placed in the estimates to meet the necessary outlay but so far no steps have taken place towards installation. Assurance, however, has been received that the money will be re-voted this year and that action may be looked for.

Dawson, Y.T.

That the placer laws of the Yukon Territory should be amended for the express purpose of encouraging companies wishing to engage in dredging operations is the opinion of the Yukon Development League, which has placed its ideas before the Dominion Government. Such companies, it is maintained, should be permitted to prospect and work low-grade placer areas, former worked by individual miners and now abandoned without molestation. They are hampered and interfered with at present to the point of hopeless disgust by persons who, as soon as they begin to prospect, stake all around and proceed to hold up the companies for excessive prices. Several large dredges representing millions of dollars of an investment are likely to be shipped out of the country if further low-grade placer ground cannot be secured. The League believes that the individual miner should be allowed permits to prospect exclusively on one-mile tracts on virgin creeks for one year with the privilege of first choice in the staking of a discovery claim within that tract. The League also recommends the abolition of the royalty on gold, arguing that as gold has lost half its purchasing power the maintenance of the gold mining industry in the Yukon is threatened.

The Provincial Assayers' Association Board has just completed a special examination of seven candidates who recently completed a five month course of study at the British Columbia University under the auspices of the Soldiers' Civil-Re-establishment Board. Four of those who wrote were successful and will receive certificates entitling them to practice their profession

in this Province. They are E. D. Beilby, V. R. Thirkel, T. J. Laing, and F. W. Broughton. The percentage of passes reflects credit on the efficiency of the course laid down for the benefit of returned soldiers as the standard could not and has not been lowered in their favor.

The Collieries.

There has been a marked falling off in the coal production of the Crow's Nest Pass Coal Field of late largely for the reason, no doubt, that comparatively little is required for coke making in comparison with the demands of previous years. At present the ovens at Fernie are idle, those of Michel alone being active. The importance of this change in conditions can be better understood when it is pointed out that in 1918 the coke production of Michel and Coal Creek combined approximated 18,000 tons a month necessitating the consumption of something like 30,000 tons of coal. The explanation of the slackness of the coke market as far as the Crow's Nest is concerned lies in the closing down of the smelters at Greenwood, Canada Copper Corporation, and at Grand Forks, Granby Consolidated Mining and Smelting Company, as well as the fact that the latter Company now is in a position to produce from Vancouver Island coal, and by the use of its by-product coking plant, the necessary fuel for its Anyox smelter. There may be other reasons behind the condition at Coal Creek and elsewhere in that district, where the men have been working little more than half time, but those given may be accepted as chiefly responsible.

On Vancouver Island the situation is different, although there was a period following the strong demand of the winter during which the trade fell off sufficiently to affect to some extent the operation of the mines. During February the Canadian Collieries (D) Ltd. kept their men at work at the three Comox mines for 17 days, at Extension for 22½ days, and at South Wellington for 23 days. The Canadian Western Fuel Company operated its properties at Nanaimo, Harewood, Reserve and Wakesiah for 24 days in February. This also applies to the collieries of the Granby Consolidated Mining and Smelting Co. at Cassidy's, the Pacific Coast Coal Mines, the Nanose-Wellington Collieries, as well as the Coalmont Collieries in the Nicola-Princeton Field. What the forthcoming season is going to bring to coal operators in the bunker business remains to be seen but it is feared that the exchange conditions are likely to have such an effect on the mercantile trade of the Pacific that the collieries of this Province will find the market unpleasantly quiet. However, the output figures for the Island collieries for the month of March indicate that the market has become brisker and that the production has jumped. This is particularly evidenced in the output of the Pacific Coast Coal Mines and it also is worthy of note that the production of the Cassidy Collieries, Granby Consolidated Mining and Smelting Company, also shows a substantial advance.

The British Columbia coal output for the month of February was as follows:—

CROW'S NEST PASS DISTRICT.

	Tons
Crow's Nest Pass Coal Co., Coal Creek	34,672
Crow's Nest Pass Coal Co., Michel	22,427
Corbin Coal and Coke Company	9,954
Total	67,053

NICOLA-PRINCETON DISTRICT

	Tons
Middlesboro Collieries	8,930
Fleming Coal Company	3,446
Coalmont Collieries	280
Princeton Coal Company	2,633
Total	15,289

VANCOUVER ISLAND DISTRICT

	Tons
Canadian Western Fuel Company, Nanaimo . .	56,813
Canadian Collieries (D) Ltd., Comox	28,515
Canadian Collieries (D) Ltd., Extension . . .	18,377
Canadian Collieries (D), S. Wellington . . .	6,450
Pacific Coast Coal Mines, Extension	8,752
Wellington-Nanoose Collieries	2,488
Vancouver Nanaimo Coal Company	1,441
Granby Consolidated Mining & Smelting Co.	14,419
Total	137,255

PRINCE RUPERT DISTRICT

	Tons
Telkwa Collieries	325

The production returns for March are available only for Vancouver Island which follow:—

VANCOUVER ISLAND DISTRICT

	Tons
Canadian Western Fuel Company, Nanaimo . .	55,769
Canadian Collieries (D) Ltd., Comox	32,587
Canadian Collieries (D) Ltd., Extension . . .	19,277
Canadian Collieries (D) Ltd., S. Wellington . .	7,219
Pacific Coast Coal Mines, Limited	10,338
Wellington-Nanoose Collieries	1,849
Granby Consolidated Mining & Smelting Co.	17,566
Total	144,605

Victoria, B. C.

The Lignite Utilization Board of Canada is expected to make important advances this year in the development of the Saskatchewan Lignite Coal fields and the furnishing of the people of the prairie provinces of the Dominion with cheaper and better fuel. One of its definite objects is to place the briquetting business on a commercial basis. For the use of the Board there has been appropriated the sum of \$400,000 by the Dominion, Manitoba and Saskatchewan Governments. The former is to contribute one-half of the amount while the two latter put up one-quarter each.

Coal lands situated adjacent to the old "Jingle Pot" mine, which recently ceased to produce, are being developed. This property is situated close to the town of Nanaimo. A shaft is being sunk and it is expected that coal will begin to be taken out in a short time. The new company, whose personnel is not yet generally known, has purchased the machinery of the Jingle Pot mine and is making use of it in its development operations.

A dispute as to the title to some 1222 acres of Vancouver Island coal lands was ventilated before a select committee of the Provincial Legislature at the session

which has just concluded. This property at present is held by the Canadian Collieries (D) Ltd. It originally belonged to the old Baynes Sound Coal Mining Company and has been developed to a considerable extent, production having been maintained years ago over a lengthy period. In 1904 when the Provincial Government of that day reached an understanding with the Esquimalt and Nanaimo Ry. Co., by which coal rights within the Island Railway Belt were secured for a number of old-time settlers or their descendants in return for which the company was granted further lands in the north-eastern section of the Island, operations had ceased at the Baynes Sound Collieries. The property of the latter came within the limits of the supplementary E. & N. Land Grant. It was found, however, that the latter company did not obtain possession of these holdings, as the Baynes Sound Company's leases still were in good standing at the time of the transfer from the Government to the Railway Company. Thereupon, so it is alleged, representatives of the Railway Company proceeded to stake the property which subsequently had become open. From them it came into the hands of the E. & N. railway and later was transferred to the Wellington Colliery Co. and thence to the Canadian Collieries (D), Ltd. It is the contention, however, of Messrs. E. T., C. H. F., and E. A. Carew-Gibson and E. Priest, that the company's representatives did not stake the land accurately and that they are the only ones who complied fully with the law following the lapse of the Baynes Sound Coal Company's leases. On this ground they are asking for possession. The Legislative Assembly's special investigating committee is understood to have refused this demand, but the claimants assert that they are to carry their case if necessary to the court of last recourse.

Some trouble has been experienced of late in the coal fields of the Province of Alberta because of the government's ruling that only miners acquiescing in the "check-off" for payment of dues to the United Mine Workers of America shall be permitted to work. This order was issued last January, but at first was not strictly enforced by the operators. Recently, however, the Minister of Labor agreed to accept responsibility for the regulation. This brought about an effort at its enforcement, with the result that the miners left work at two camps at Coleman, Alta., and at Blairmore and Canmore.

WHAT CANADA CAN DO BY DEEPENING THE ST. LAWRENCE-GREAT LAKES WATER ROUTES.

Can construct the greatest waterway in the World.

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Can develop electric energy that will make Canada the workshop of the World.

Can enable Nova Scotia to send coal to Ontario.

Can open up the coalfields of Alberta by providing the Western Provinces with the cheap transportation facilities which are essential to her development.

Can forward the day when Alberta will be the greatest industrial and manufacturing province of Canada.

CORROSION IN WIRE ROPES

Experience has shown that wire ropes of compound-construction, subjected to corrosion influences, are likely to deceive engineers as to the strength remaining in them, says a circular issued to managers of mines on the Rand, South Africa. Where reduction of diameter or circumference of the rope has taken place, not accounted for by the evidence of wear, the part of the rope under examination should first be fully loaded and then relieved of the load. Any noticeable difference in circumference under these circumstances and the slaking of the outside wires when the load is off will indicate that internal corrosion has taken place. The extent of corrosion inside the strand can only be estimated by the slackness of the outside wires. The corrosion between the strands can be further examined by untwisting the rope or displaying the strands sufficiently with a marline spike.

Engineers are apt to imagine that reduction in the size of a rope may be due to some collapse of the hemp core. In a test at the mines department mechanical laboratory of a 1.28 in. diameter rope, the hemp core was entirely removed for about 5 ft. of the length. The specimen was gradually loaded up to 30 tons, but beyond a slight increase of the lay from 10½ to 11 in., subsiding after test to 10¾ in., there was practically no alteration in the shape or size of the rope.

In some recent tests of corroded ropes, the following results were obtained:

Original diameter, in.		Original breaking load, lb.	Diameter at test, in.	Breaking load at test, lb.
Rope.	Wires.			
1.50	0.099	222,208	1.41	191,960
1.50	0.099	222,208	1.40	166,660
1.50	0.099	222,208	1.30	137,260
1.50	0.099	222,208	1.23	66,880
1.50	0.102	220,000	1.22	97,260
1.25	0.115	148,700	1.23	137,660
1.25	0.115	148,700	1.00	78,920

In all the above-mentioned cases the outside wires were less than half worn, but the internal corrosion was excessive. The wires were brittle also. Experience has shown that the remarks concerning corrosion on the certificate of biannual tests are taken as merely applying to the test specimen and not considered as having a bearing on the state of the rest of the rope.

THOMAS'S DIRECTORY OF AMERICAN MANUFACTURERS.

The eleventh edition of the Thomas' Register of American Manufacturers, dated January 1920, has just been published, in which more than 300,000 names of United States manufacturers of products classified under over 70,000 headings are listed. It weighs 17 pounds and contains 5,980 advertisements, said to be the largest number of advertisements ever printed in a trade publication.

The register is divided into three main sections with an index totalling 176 pages. The classified section (3,340 pages) furnishes a complete list of the makers of every known United States product, classified according to the article, eleven pages alone being devoted to the single item of acids. A capital rating is also given of each manufacturer, showing the amount of capital invested and the approximate size of the concern. About 800 pages are devoted to two other main sections listing the trade name or brands of manufactured products, and to a continuous list of the names of manufacturers in alphabetical order from A to Z, also giving the addresses of head office, branches, names of officers, etc., of the concerns listed.

Thomas' Register lists all names absolutely free of charge and irrespective of advertising support. The purchasing agent and buyers for nearly 25,000 important business houses use it, several hundred of these being Canadian concerns which find it indispensable when buying United States products.

An international trade section, listing exporters and importers, is included in the eleventh edition, together with a directory of banks, commercial organizations and trade papers in the United States and Canada.

The Thomas' Publishing Company, New York, are represented in Canada by the Canadian Buyers' Register Company, 92 Constance Street, Toronto, from whom specimen pages, etc., can be obtained. The price of Thomas' Register in Canada is \$17.50, all charges prepaid.

TURNING THE SCREWS ON CANADA.

The United States railway companies have served notice that freight rates on shipments of American goods must be paid in American currency from the point of shipment to any destination in Canada. This arbitrary ruling takes an extraordinary advantage of the exchange situation, since the American roads declare they will not permit reshipment at the border, where Canadian currency could be used at full value for part payment of the freight charge.

The possession of a strangle-hold upon the Dominion permits American business men to indulge in this sharp practice. Canada's dependence on the United States for coal is the root of the whole trouble. It encourages exploitation of the Canadian market with no limit except the forbearance of the exploiter. It permits the foreigner to levy a tax upon the Canadian public which, in the present case, will amount to ten per cent and over.

Here at last is the economic third degree. Question may be raised if any more striking illustration could be imagined to proclaim the meaning of Canada's needless fuel disability. And it happens to come at the very moment when Senator Underwood of Alabama is urging Washington to tighten the coal grip on Canada's throat so that our pulpwood resources may be utilized regardless of our own needs and in the interests of American paper manufacturers.

Foreign exploitation faces Canada allied with Winter. This menace will cast its shadow over the land, and work its repeated hardships, until the people of Canada, led by a vision of national self-sufficiency, utilize the enormous coal deposits of their own Dominion. The very soil of the nation cries out against this self-inflicted shame and offers succor in full abundance.—Montreal "Star" April 29th.

THE HAND THAT ROCKS THE CRADLE RUNS THE "JACKHAMER".

By F. A. McLEAN.

The accompanying photographs taken in the Buxton Limestone Works quarries in England during the war, serves to illustrate the remarkable way in which the women of the Old Land so nobly answered the call and "carried on" when their men folks marched off to "Flanders' Fields." For many years it has been customary to employ women for certain kinds of light factory work such as in textile mills, and electrical works where it was found that their temperament made them of much more value for certain kinds of monotonous routine work than men.

With the coming of the war and its accompanying scarcity of man power, however, women were given employment at various tasks for which it had been long considered that only men were suitable. Thus there were few industries in which female help was not tried out with varying degrees of success. Women doing various forms of office work that was usually done by man, operating elevators, street cars, motor trucks and machine tools in munition plants, were a sight more or less familiar to us all, two or three years ago. So well did some of these women perform their allotted tasks, that in many industries they will probably continue to be employed on work for which it would have been once thought that only their fathers, brothers or sweethearts could properly handle.



WOMEN AT WORK IN BUXTON LIMESTONE
QUARRIES

In England, due possibly to the fact that they were stronger than in this country, or to the more incessant demand for labor, women were given much heavier kinds of work than they were in the United States or Canada. Thus, perhaps, it was only natural that women should be used to operate large cranes in shipyards and steel mills, erect and paint structural steel, load trucks and cars, handle heavy timbers, load and tram heavy muck in mines and collieries, excavate for foundations and so on, ad lib., all of which are forms of work that are usually associated in the minds of most people with good strong men.

This photograph also lends emphasis to the wonderful progress that has been made in the development of power rock drilling equipment during the last decade or two. With this idea in mind it is interesting to speculate on what would be the sensation of the immortal shades of the late J. J. Couch and Joseph W. Fowler, were they allowed to visit the earth again and witness the transformation that has taken place in

their clumsy drill of the early forties through the ministrations and inventive genius of such men as Sergeant Waring, Halsey, Githens, Ingersoll and Leyner.

What a far cry it is from Couch's ponderous drill with its big steam boiler from the invention of which mining methods practically date, to the little "Jackhammer" weighing only a fraction as much and having many, many times the drilling speed and yet withal, so easy to operate and control that even women can run them if necessary without undue fatigue or physical strain.

A VOICE FROM THE NORTH-WEST.

Hyder Miner: The voice of the wildcatter will soon be heard in the land.

Already we read in outside papers glowing descriptions furnished a too gullible press by companies unknown to the North, with claims unheard of outside of the recording office.

A mining man recently returned from Vancouver told "The Miner" that promoters were thicker in the lobby of the Vancouver hotel than second-growth spruce saplings on an old burn. And if this is true of Vancouver, where there is less interest taken in mining than in any city of its size west of the Rocky mountains, what must be the situation in other cities where a real interest is manifested in the country's greatest industry!

We have heard the remark that every mine was, at initial stage of its existence, a wildcat. This is not true. It is true that every mine was at some time a prospect, but there is a vast difference between a prospect with well defined surface showings of ore, which intelligent development may prove to extend to depth, and a wildcat with its few acres of country rock, whose owner staked it because some prospects in the district were showing up well, and whose promoters foist it upon the public with the full knowledge that not a dollar's worth of ore will ever be extracted from it.

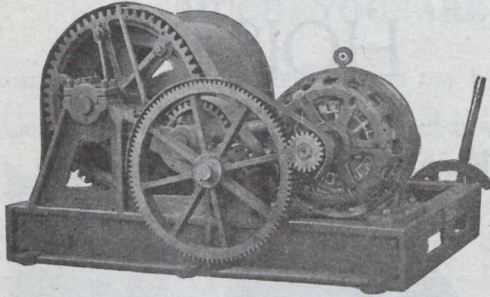
However, we are inclined to pity the public with too great a pity. Anybody who will invest his money in mining stocks because of a high-sounding name or glowing prospectus, and without making such inquiries as to any ten-year-old child should have brains enough to make, is not entitled to pity.

There is only one good thing about a wildcatter. The money he extracts from the public he generally puts back into circulation with both hands. As a rule his easiest victims are people who are so tight they wouldn't buy a cheese sandwich for a starving orphan but who pull their money out of the banks when told by some suave gentleman that they can easily double it with no other effort on their part than signing checks.

Many of the companies now organizing are being formed in good faith and the money turned over to them will be expended honestly. Such companies are public benefactors. They undertake mine prospecting and development work which the individual, unless he belonged in the multimillionaire class, could not undertake. If they fail, no one is hurt much because no one has invested much. But if they develop a mine, the money taken from the ground is distributed among the many shareholders, people of moderate means, to whom an augmented income is of some benefit.

A MARSH HOIST IS MADE THE RIGHT SIZE FOR YOUR MINE

and in either Steam Power or Electric Power



This shows one of our Electric Mine Hoists. We make many other types. Send for our catalogue of Mine Hoists, Cars, Cages, Buckets, etc., and see what we offer you. It will repay you.

From the little 10 Horse Power size for prospectors or small mines to the massive 50 Horse Power size, one of our 7 sizes should be just right for your mine.

We are specialists in the building of Hoisting Machinery of all sorts. For nearly a quarter of a century we have been designing and building Hoists, and have developed a Hoist that we are really proud of—proud because of the record of good work they have done, and are doing in mines, quarries, and other classes of work from one end of Canada to the other.

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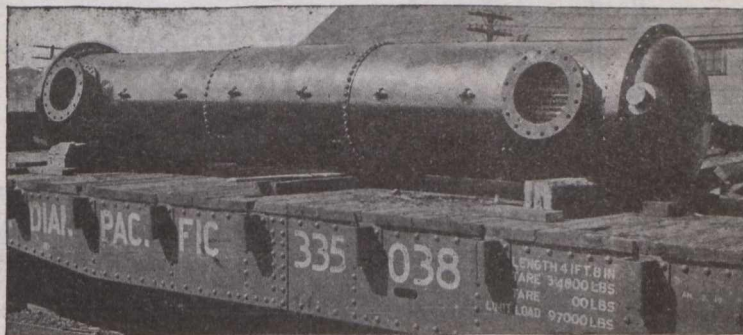
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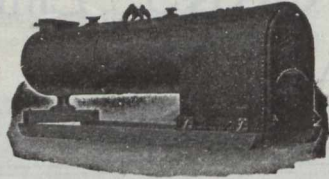
ONTARIO DOES NOT PROPOSE INCREASE IN IN MINING TAXES IN 1920.

Hon. Harry Mills, Minister of Mines, has stated in the Legislature that he is of the opinion that there will be no change in the Ontario Mining Act this session. The statement was made in reply to a question by Hon. G. Howard Ferguson, who said that he had received several letters from which he had gathered that it seemed to be the general impression that there would be an increase on the tax on mines this year. He thought an announcement would have a good effect on the general public interested.

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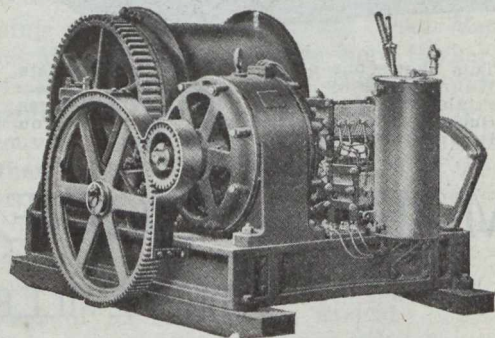
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Manufactured in Canada



Single Drum Electric Mine Hoist.

This type is built in four sizes from
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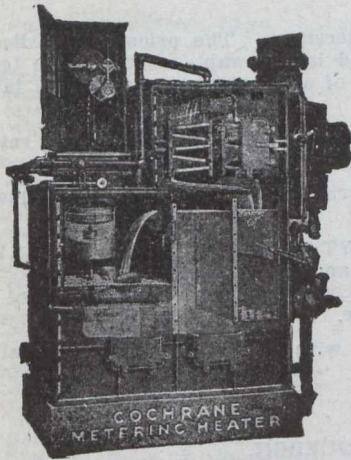
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How many pounds of coal do you use to produce a thousand pounds of steam? 200, 150, 100 or less. A Cochrane Metering Heater will tell how many pounds of water are evaporated per pound of coal, and it will instantly show any improvement in evaporation due to better fuel, better methods of firing, better condition of heating surfaces (removal of soot and scale), better condition of boiler setting (stopping up air leaks), etc.



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PROVINCE OF QUEBEC

MINES BRANCH

Department of Colonization, Mines and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is \$10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of \$10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of \$5 an acre for SUPERIOR METALS, and \$3 an acre for INFERIOR MINERALS

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

HONOURABLE J. E. PERRAULT,
MINISTER OF COLONIZATION, MINES AND FISHERIES, QUEBEC.

BRITISH COLUMBIA

The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, \$75,436,103; Lode Gold, \$97,121,786; Silver, \$46,839,631; Lead, \$42,294,251; Copper, \$145,741,069; Other Metals (Zinc, Iron, etc.), \$13,278,058; Coal and Coke, \$187,147,652; Building Stone, Brick, Cement, etc., \$28,843,272; Miscellaneous Minerals, \$651,759; making its mineral production to the end of 1918 show an

Aggregate Value of \$637,353,581

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1895, inclusive, \$94,547,241; for five years, 1896-1900, \$57,605,967; for five years, 1901-1905, \$96,509,968; for five years, 1906-1910, \$125,534,474; for five years, 1911-1915, \$142,072,603; for the year 1916, \$42,290,462; for the year 1917, \$37,010,392; for the year 1918, \$41,782,474.

Production During last ten years, \$313,976,022

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

Full information, together with Mining Reports and Maps, may be obtained gratis by addressing

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VICTORIA, British Columbia

The Canadian Miners' Buying Directory.

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Prest-O-Lite Co. of Canada, Ltd.
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Mine and Smelter Supply Co.
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Canada Metal Co.
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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.
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The Mine & Smelter Supply Co.
Northern Canada Supply Co.
Jones & Glasco.
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Goodyear Tire & Rubber Co.
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Mussens, Ltd.
The Wabi Iron Works

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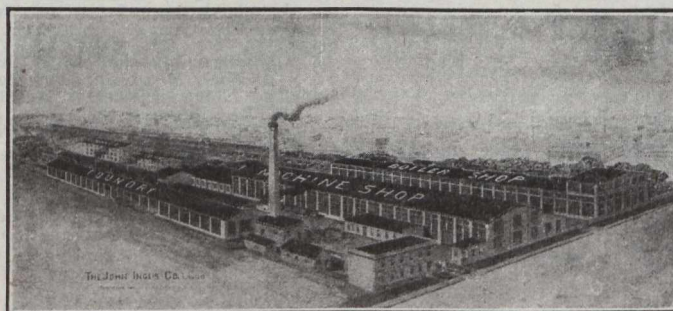
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Canadian Miners' Buying Directory.—(Continued)

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:

Dominion 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.
Lyman, Ltd.
Mussens, Limited
The Mine & Smelter Supply Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

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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., Rockaway, 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.
Lyman, 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, Ltd.
The Wabi Iron Works
- Pumps—Pneumatic:**
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Sullivan Machinery Co.
- Pumps—Steam:**
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
The Electric Steel & Metals Co.
The Mine & Smelter Supply Co.
Mussens, Limited
Northern Canada Supply Co.
Smart-Turner Machine Co.
R. T. Gilman & Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works
- Pumps—Turbine:**
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works
- Pumps—Vacuum:**
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
The Wabi Iron Works
- Pumps—Valves:**
Canadian Fairbanks-Morse Co., Ltd.
- Pulleys, Shaftings and Hangings:**
Northern Canada Supply Co.
Canadian Fairbanks-Morse Co., Ltd.
The Wabi Iron Works
- Pulverizers—Laboratory:**
Mine & Smelter Supply Co.
The Wabi Iron Works
Hardinge Conical Mill Co.
- Pumps—Boiler Feed:**
Smart-Turner Machine Co.
Northern Canada Supply Co.
Canadian Fairbanks-Morse Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
Mine & Smelter Supply Co.
- Pumps—Centrifugal:**
Canadian Fairbanks-Morse Co., Ltd.
The Electric Steel & Metals Co.
Smart-Turner Machine Co.
Canadian Mead-Morrison Co., Limited.
Canadian Ingersoll-Rand Co., Ltd.
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works
- Pumps—Diaphragm**
The Dorr Company
- Pumps—Electric**
Canadian Fairbanks-Morse Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
Smart-Turner Machine Co.
- Pumps—Sand and Slime:**
Canadian Fairbanks-Morse Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Mine & Smelter Supply Co.
The Electric Steel & Metals Co.
The Wabi Iron Works
Smart-Turner Machine Co.
- Quarrying Machinery:**
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited
Mussens, Limited
R. T. Gilman Co.
- 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.
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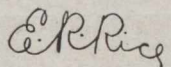
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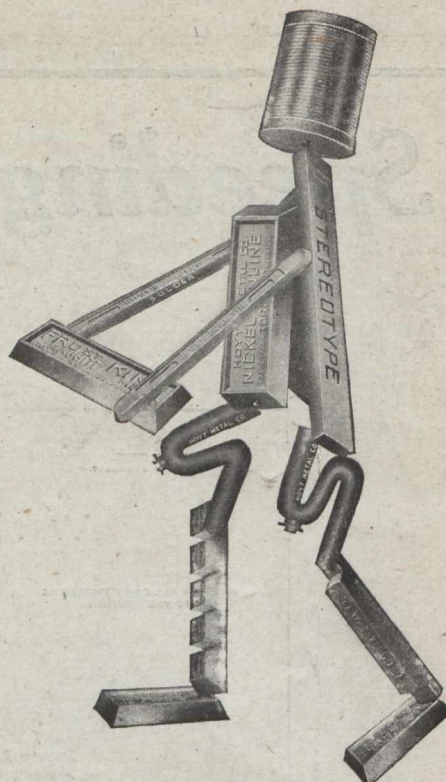
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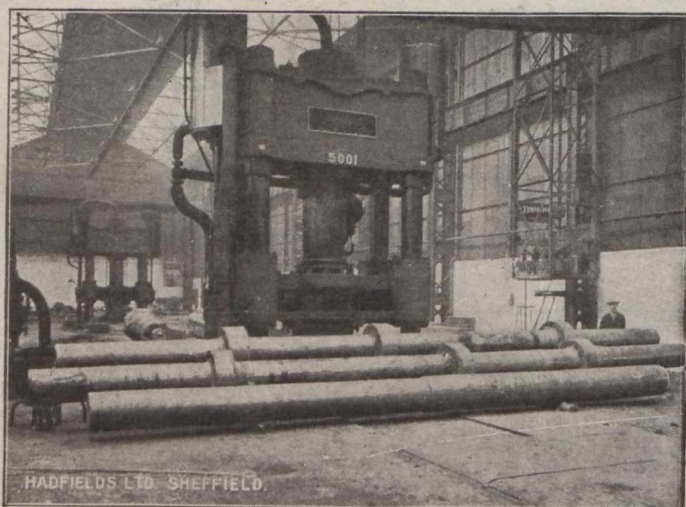
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