CANADIAN MINING JOURNAL

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It is the duty of all to buy VICTORY BONDS and, by supporting the present Loan, to maintain Canada's credit and secure her future prosperity.

CANADA
DEPARTMENT OF MINES

HON. MARTIN BURRELL, *Minister* R. G. McCONNELL, *Deputy Minister*

MINES BRANCH

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.

Occurrences and Testing of Foundry Moulding Sands. Bulletin No. 21, by L. H. Cole, 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, 1917.

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 95. Onaping Map-Area, by W. H. Collins.

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

Memoir 107. Road materials in the vicinity of Regina, Saskatchewan, by L. Reinecke.

Memoir 108. The Mackenzie River basin, by Charles Camsell 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 112. Geology of the district belt of southwestern Alberta, by J. S. Stewart.

Map 42A. Duncan sheet, Vancouver Island. Geology.

Map 44A. Sooke sheet, Vancouver Island. Geology.

Map 115A. Sheep river, Alberta. Topography.

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

Map 179A. Onaping; Sudbury and Timiskaming districts, Ont. Geology.

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, Qubec. Geology.

Maps 1697 and 1698. Explored routes in a belt traversed by the Canadian Northern Ontario railway,—in two sheets: Sheet 1 Gogama to Missonga, Sudbury district; Sheet 2 Oatland to Penhurst, Algoma district, Ontario.

Map 1690. Whiteburn Gold District, N.S. Geology.

Map 1702. Klotassin, Yukon Territory. Geology.

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

Map 1710. Bothwell-Thamesville oil region, Kent county, Ontario.

May 1712. Foothills of Southern Alberta, St. Mary river to Highwood river. Geology.

May 1714. The Niagara peninsula, Ontario. Geology.

May. 1715. The Ontario peninsula. Geology.

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

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

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

PROVINCE OF ONTARIO

DEPARTMENT OF LANDS FORESTS & MINES

BUREAU OF MINES

G. H. FERGUSON, Minister.

Ontario's Mining Lands

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favorable for the occurrence of minerals, 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver mines of Cobalt occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain Mines.

Practically all economic minerals (with the exception of coal and tin) are found in Ontario:—actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt and tale. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

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 loca-tion in surveyed or unsurveyed territory.

For list of publications, illustrated reports, geoligical maps and mining laws, apply to

Thos. W. Gibson,
Deputy Minister of Mines,
Toronto, Canada

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Ste. Anne de Bellevue, Quebec.

REGINALD E. HORE, Consulting Editor,
1403 C. P. R. Building, Toronto.

The editor cordially invites readers to submit articles of practical interest which, on publication, will be paid for.

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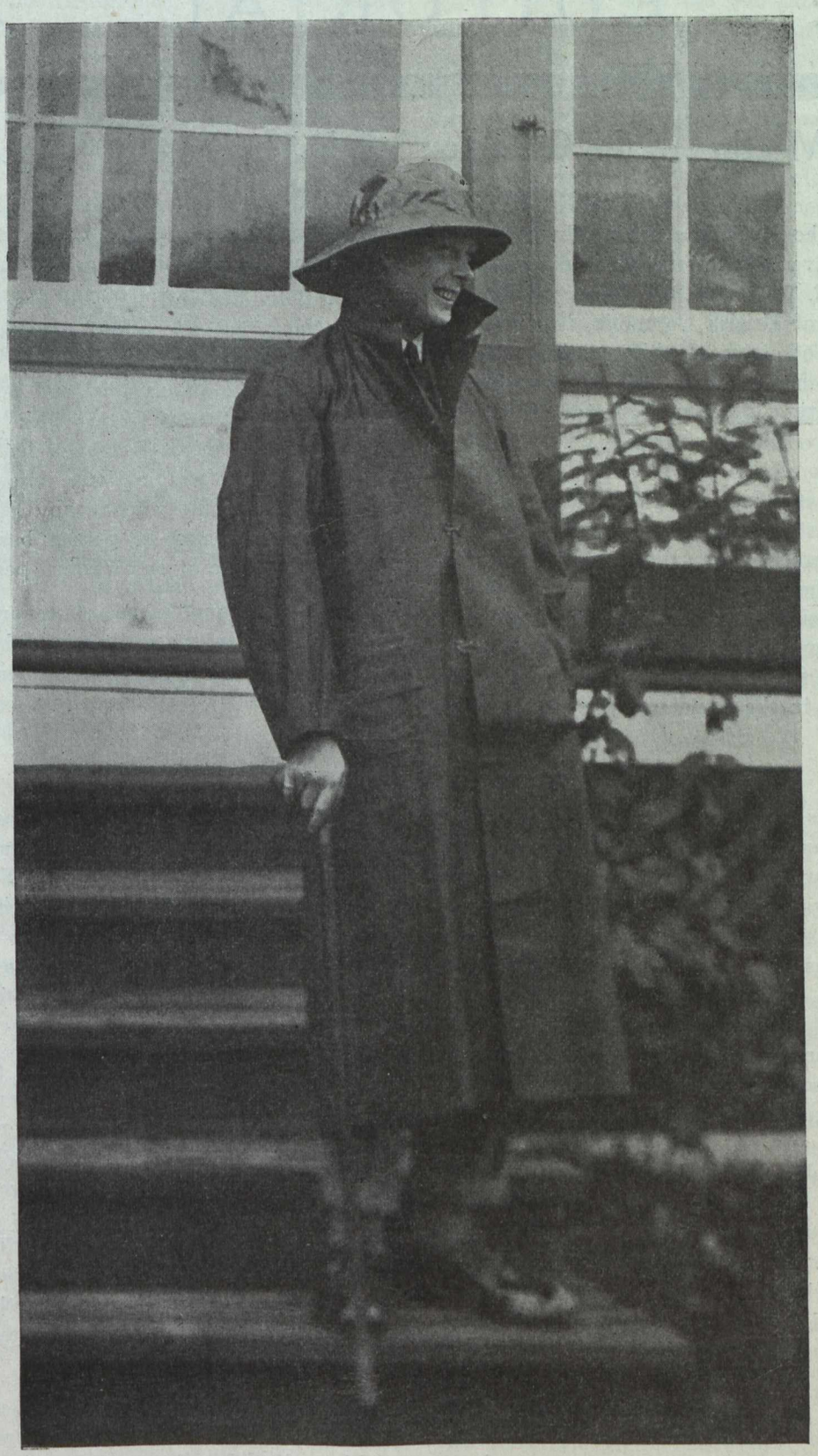


GENTLEMEN!—THE PRINCE.

EDITORIAL

The Meeting of the Canadian Mining Institute in Vancouver November 26, 27, 28, 1919

A meeting of the Canadian Mining Institute will be held in Vancouver during the concluding days of November. Dr. E. T. Hodge, Professor of Geology at the University of British Columbia, has been appointed General Secretary of this meeting, and all the news that reaches us from British Columbia indicates that a meeting is being organized which will be worth while travelling to attend.

The mineral production of British Columbia has attained the greatest value in the history of that Province. It is the second province of Canada in monetary value of mineral output, and in variety of product it leads all the provinces.

Signs are increasing that the immediate future of the mineral industry in British Columbia is exceedingly bright. The two western provinces which will be most interested in the Vancouver meeting include that part of Canada which contains the bulk of Canada's basic coal asset. The tremendous coal reserve of British Columbia and Alberta has such far-reaching implications that we would not dare to attempt to sketch them even in roughest outline. The possession of coal connotes both industrial and political power. It assures the future. It provides the most stable foundation on which to rear a national industry, a national culture, and national independence, always provided the people who occupy the land are virile and upstanding, and no person has ever questioned this characteristic of our western people.

More definite announcements regarding this meeting will be found in succeeding issues of the 'Journal,' which, needless to say, extends its heartiest good wishes for a large and successful meeting.

The Princess Colliery Tunnel

Mr. James Purves describes in this issue an unusual and interesting connecting survey which was successfully carried out under his direction in the Princess Colliery of the Nova Scotia Steel & Coal Company at Sydney Mines. It was the difficult conditions under which the work was carried out that will interest the practical surveyor, prominent among which was the constant movement of the strata caused by "creep." The connecting tunnel was driven through the waste, or, to use the phraseology of the north-country miner in England, the "gob was scoured" for a distance of 8,000 feet, the roof and pavement and the partly consolidated fallen rock lying in between being in constant but irregular movement. Long sights were infrequent, and it is mentioned that in one case nine settings of the instrument were required for 88 feet of distance. The work was subject to interference by workmen employed on the tunnel excavation, and many other distractions were the lot of the survey parties.

As a record of an unusual and difficult piece of work well done we believe Mr. Purves's account will have a practical interest to many of the readers of the 'Journal,' and we may further state that it was only upon our strong representations that the account should be published for the information of other mining men, that we prevailed upon Mr. Purves to write the description.

The Princess Colliery is in many respects an interesting place. Commenced by the General Mining Association in 1868, it was called the "New Winning," a name that has become almost humorously incongruous today. Mr. R. H. Brown, formerly Manager for the G.M.A., is authority for the statement that in this colliery in 1876 the first undersea coal in North America was won.

The Colliery is unique in another respect, inasmuch as the "Princess Deeps" are now extended seawards approximately 2¼ miles, and will require to be extended for a distance of approximately 3½ miles from the shaft bottom before they emerge from the leased area of the Dominion Coal Company and gain the outlying areas of the Scotia Company. Thus, the Princess Colliery has the longest undersea extension in America, and its plans contemplate the furthest seaward extension of coal extraction yet arranged for on this side the Atlantic.

The necessity for accuracy in the connecting survey to ensure a straight haulage-road arose from the far-reaching plans for future undersea mining, and with this also in view the Princess deeps have been driven of unusual width, with a view to passing large volumes of air. Similarly adequate provision for rapid long-distance haulage of coal is being made. In very many respects the Princess Colliery has no counterpart.

Britain's Debts Will Be Paid

A despatch from Atlantic City reads that at the International Trade Conference, which commenced there on the 20th October, the delegates were surprised when Sir J. H. Simpson, representing Great Britain, said that his country did not ask financial aid from any organization, but merely wished that no obstruction should be placed in the way of ordinary business.

Why should such a statement excite surprise?

Sir James correctly stated that no Government could stand in England which would contemplate for a moment any weakening in regard to the payments of the country's debts. "England," said Sir James, "is determined to pay her debts. England has always paid her debts, and will."

Brave words, and best of all, true words. The statement has two implications. Britain pays up, and she will see that other people do the same. The discharge of obligations in business, as in war, is an ingrained British habit.

Sir James further asserted: "The future of England is not dark. It is as bright as could be hoped for after making allowances for the war." There is one debt that Britain cannot repay, the debt she owes to those who died for her, but all other obligations will be liquidated in due course. Those who carelessly think that because Britain lost one million men in war, and emerges from the war with seven billion pounds national debt, she will fail in any particular, are wholly mistaken. The generation of Britons now passing into manhood, in four quarters of the globe, have passed five of the most impressionable years of life amid such fires of patriotism as come to full glow only in times of dire national emergency such as these five years were. This fact should not be lost sight of. There never was such a generation of youth in British history as that which will soon shape our policies, and, if they are not worthy of their fathers and mothers, they will be the first recreant generation in British history. That Britain is entering new ground is not to be denied. Old things are passed away and many things are become new, but in everything that makes for national strength the British peoples were never so remarkable as they are today. Our great traditions have been worthily sustained and notably added to, our national word and integrity cannot be impugned, we have emerged victorious from a war of Titans, desperately waged; our women were worthy of their men. The commonwealth of sister nations that, for want of a better term, we call the British Empire, may be financially poorer, but it is richer in everything else that matters, and, after all, there is no more goading spur to a proud and independent people than debt.

Our Northern Ontario Letter

The 'Journal has arranged for a weekly letter from its Northern Ontario correspondent, in which it is hoped to present all the important current news from the now numerous centres of mining activity in the North Country in a digested and convenient form. The sources of information from which our correspondent will prepare his weekly communication are correct and authoritative, and we have every reason to believe that in the future, as has been the case in the past, our Northern Ontario news will give our readers a correct impression of happenings and new discoveries in a district of Canada that annually becomes more impressive in its extent of mineral wealth and production. Our correspondent's weekly letter will be exclusive to the 'Journal,' and it is hoped will develop into a feature of this magazine, which while it will contain accurate news, will also be distinguished by the correct perspective which arises from continuity.

Matters deserving of more extended description and comment will not suffer by summarization, but where it appears desirable will be separately dealt with.

Misunderstandings between shift-bosses and the men under them are perennial. The following letter, written by an unhappy chuteman to the superintendent, was printed in the "Granby News," which states that as good chutemen were scarce the man was transferred to another shift-boss with satisfactory results:

"Dear Sir:—I very often heard from the Granby's employees say: that no man get along with B. Blank. Last Saturday night I found what I thought was exaggerate is perfectly true. I been worked for many bosses in this country and I noticed always that they could obtain as much and probably more work from their men without use any rough Language. We chutemen the trouble we have as: big muck, timbers, rails, pipes in the chutes headache from the powder, car off the track 10,000 compinations to get hurt. All this trouble is not enough for the money we get but we got to listen the educationless shift boss's bad words "as side dish." For the second time B. Blank offended me last Saturday night without any reason, but just because I'm Italian and also he had the mouth to talk with not because he had any brains. I told the motorman to report me off yesterday I don't like give any more chance to get me in trouble. I soon lose money than my liberty. I thank you for your valuable time you spent to read my important communication and pardon me to not call at your office personally because I think I can explain myself better in writing and this will cause less disturb too."

The Princess Colliery Tunnel, Sydney Mines, N. S.

An Unusual Connecting Survey, Made Through an Undersea Colliery Waste, Affected by Creep

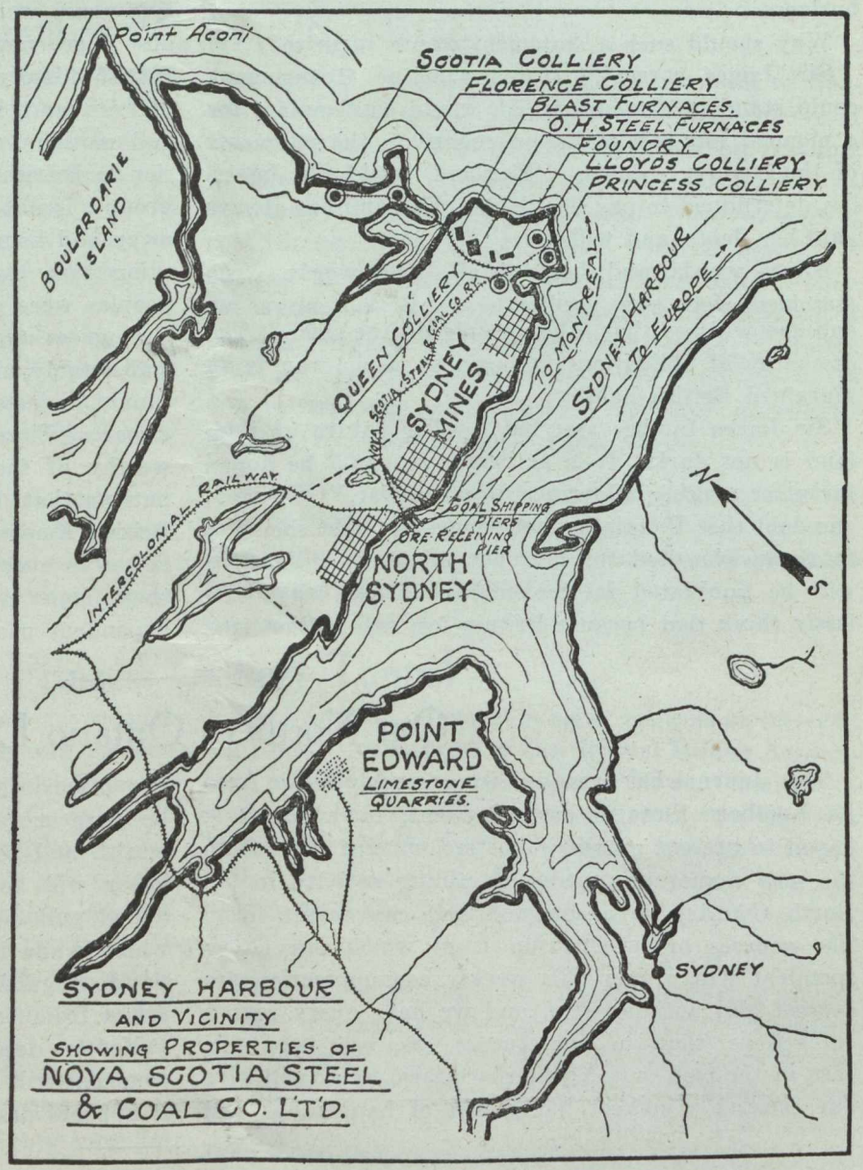
By JAMES PURVES,
Engineer, Nova Scotia Steel & Coal Co.

In presenting the following, there is no idea of giving to those, who may deem it worth while reading this article, any new or original ideas. Nor is it intended to infer that anything out of the ordinary was achieved. It may, however, be interesting to some, inasmuch as it is evident that, considering conditions under which the survey was made, and the many opportunities afforded for personal errors to creep in because of difficult instrument positions and long tiring periods of work, that undoubted errors of comparative minor importance, evidently in the long run offset each other to such an extent, that results were remarkably good.

In "Princess" Colliery or "New Winning" as it was known, operated by the General Mining Association from 1868 to 1901, and since by the Nova Scotia Steel & Coal Co., the submarine areas were practically mined out in 1913 to surrounding areas held by Dominion Coal Co.

The Nova Scotia Steel & Coal Co. had acquired areas beyond the Dominion Coal Co. at a distance of two miles further out to sea. In order to win these areas it is necessary to go through the Dominion Coal Company's territory; and two square miles were acquired by lease for this purpose from the Dominion Coal Co.

The relative location of these two square miles of what might be termed connecting leases; to the main hoisting shaft at Princess Colliery, fixed rigidly the direction in which deeps had to be driven in order to ultimately handle coal efficiently over a route which will be from four to five miles long, probably longer . It will be readily seen that this main outlet for the Colliery output had to be straight or rather it was admitted that if straight, haulage problems would be made easier and operating, generally facilitated for all time. In order to bring this new coal to the pit bottom on a straight road, it was necessary to tunnel through the old workings a distance of about 8,000 ft. Many of the districts in the old workings through which the tunnel would pass, had pillars drawn, and of course was all down. Most of the old rooms and pillar workings were also in a fallen state.

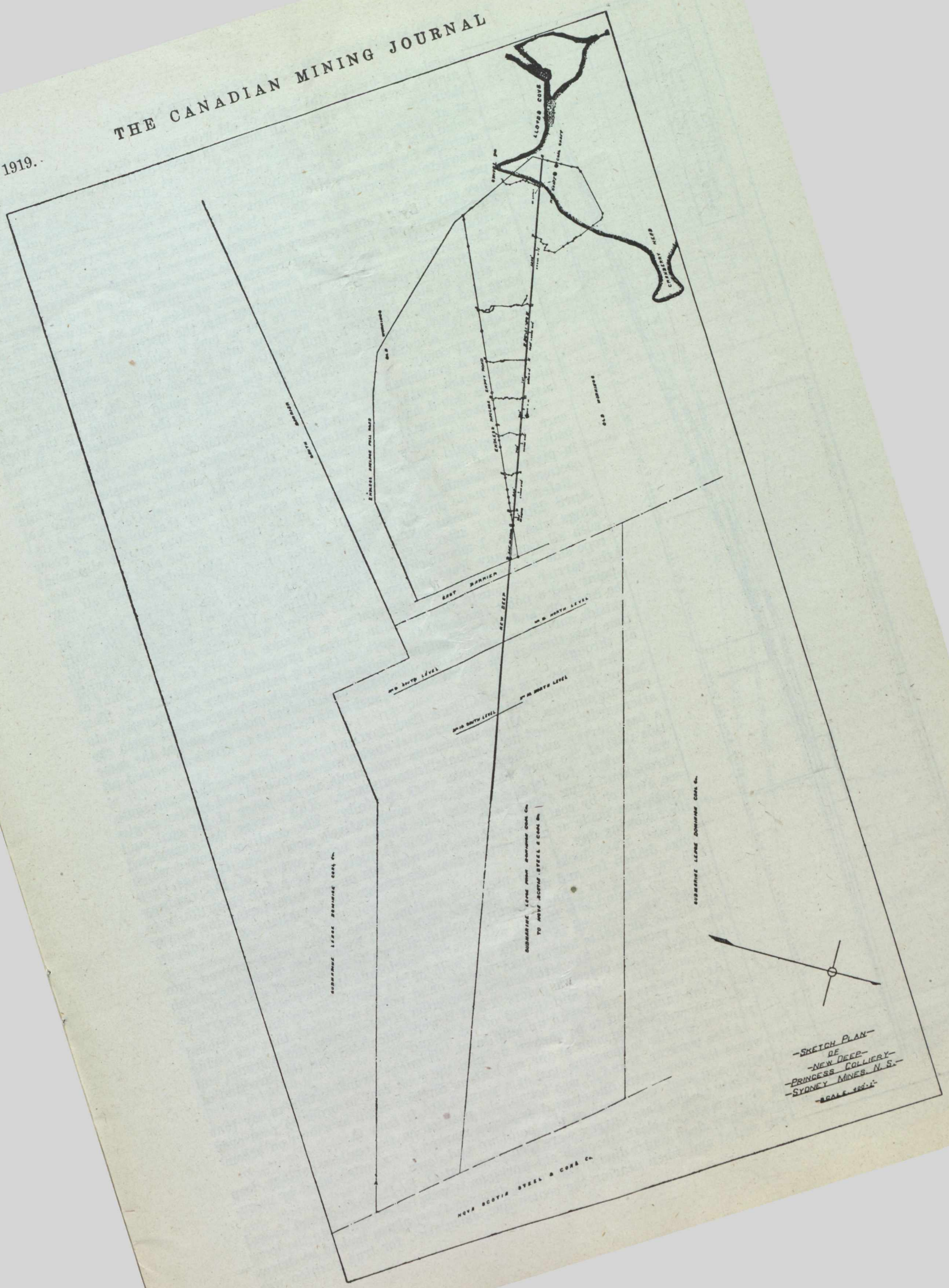


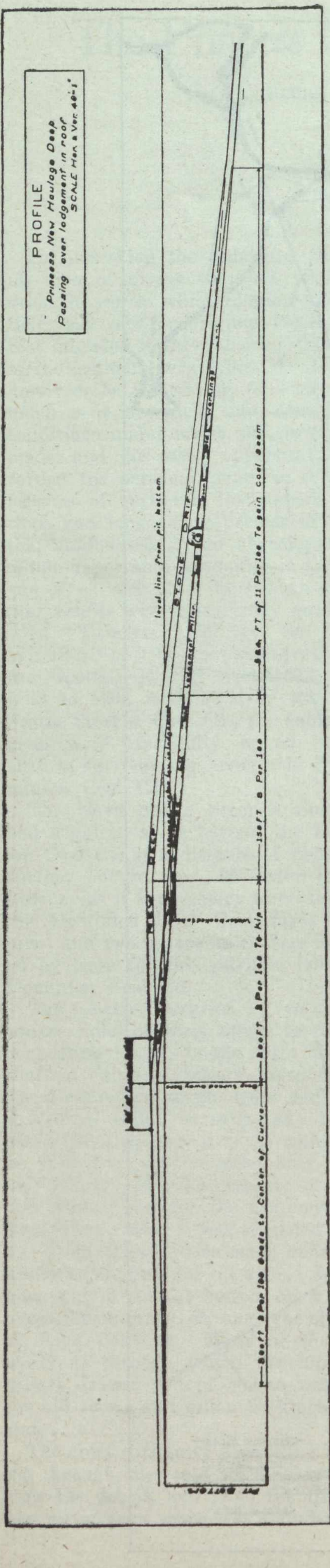
The chief difficulty presenting itself to all in tunneling through these old workings was to find a place to stow the debris, and from the first it was remarkable how little open space was found available. Therefore, apart from the time that would be required to complete this work from a fewer number of openings it was necessary to get as many faces going as possible, with the hope of finding suitable stowing room.

To this end, old levels were ribbed in at eight different points along the old haulage way. The positions chosen for ribbing in to the locus of the proposed deep just about approximately divided the overall distance.

The accompanying sketch illustrates what the writer has been trying to explain.

Mention has been made of difficulties in making the survey, or rather difficulties that appealed at the time. Some of them may be mentioned; for instance: Some districts were undergoing a "creep." If not undergoing creep at the time, creep was possibly brought on or


LLOYDS COVE
EXPERIMENT HEAD
EAST BARRIER
NEW DEEP
NO. NORTH LEVEL
NO. SOUTH LEVEL
NO. SOUTH LEVEL
NO. SOUTH LEVEL
SUBMARINE LEASE DOMINION COAL Co.
SUBMARINE LEASE DOMINION COAL Co.
SUBMARINE LEASE DOMINION COAL Co.
NOVA SCOTIA STEEL & COAL Co.
SKETCH PLAN
OF
NEW DEEP
PRINCESS COLLIERY
SYDNEY MINES, N. S.
SCALE 200 ft.



accelerated by the ribbing in of old workings in order to find a place of beginning. As a consequence all marks in these districts were constantly shifting their position. In many places, check surveys proved angles to read differently at all times and as much as two minutes of arc in a distance of 50 feet was noted over a period of 48 hours Every time the instrument was taken into these districts for purposes of alignment, it necessitated a re-survey from some point known to be dependable. These places, cleaned out or ribbed, for no other purpose than to get in with an instrument were not always boulevards, nor were they any higher than necessary to say the least, and with all had to be timbered. Furthermore, the line of least resistance was invariably followed, and as an average length of sight in one case to locus of deep was 88 ft. for nine settings of the instrument, it can be well imagined that the instrument was squeezed into many difficult positions in order to get as long a range as possible or even to get along at all. The work of worrying into the old gob with pick and shovel, horse and tram, in order to find position, was prosecuted day and night, and the transit was there at all times, but the survey could not hold up the work for long; the annoyances encountered can be left to the imagination. Morals suffered extremely.

There is a gentleman of the writer's acquaintance working for a sister corporation to the south, who could have done justice to the occasion, but while his remarks would have been literature, the same remarks would possibly not have been interesting to a publisher.* (See p. 794, Journal, Oct. 15.—Ed.)

Taking it all through, there was every reason to fear that in spite of every care, errors would be bound to creep in sufficiently serious to put alignment badly out, and necessitate a widening of the tunnel on one side or the other, in places, to permit a readjustment of centre line, and indeed until all connections were made this nightmare was ever present.

Referring to accompanying sketch, the survey was begun at pit bottom on April 25th, 1913, after previous plumbing the shaft, and tying up the shaft plugs with No. 1 monument at General Office. (This monument is tied up with all Company lease corners.) The survey was carried down the empty rope side of the endless haulage system, a distance of 8,944 feet to a point at the barrier previously established on the new proposed deep centre line. This point and a point fixed 300 ft. south of the pit bottom were the objectives to be lined up, and the production of a line through these points would reach the outside submarine areas of the Company at a desired position and at the same time pass through the leased areas in such a direction as to give a two-sided pit all through.

This survey was checked back from barrier to pit bottom over the same route, but on different points; all horizontal angles were redoubled and vertical angles read to minutes. All measurements were made on the plane of the coal, and afterwards reduced to horizontal measurement. This survey was considered a base survey and checked over very carefully. The conditions under which this part of the work was done were comparatively good. The Haulage Deep was straight for long distances, the average cross section of the roadway throughout being about 10 ft. wide by 5 ft. high, giving a fair opportunity to see over, or by coal tubs. These tubs were left on the rope during the survey which was made at night rather than disarrange the operations of the colliery the following day.

Small brass hooks were used for stations, these hooks being screwed into plugs drilled for and driven into the rock roof. From these hooks the plumb bob was flung on a fine line. By holding the white reflector of a Hirsch electric lamp behind this line, it was clearly visible and distinct at 500 feet.

Care was exercised in holding the bulb of the lamp directly in line behind the string for sights longer than 500 ft. or at points so distant that the string was not visible. On the satisfactory completion of this survey, the latitudes and departures of the objective points A and B were calculated and the direction of the closure established and turned off at A and B.

At B the work was begun up and down. It might be interesting to say that at A the tunnel had to be thrown up into the rock roof in order to pass over the main water lodgement at the pit bottom, dipping again as shown on accompanying profile to meet the coal at a point 1,016 ft from A.

After work at A and B was begun, the position on the endless haulage deep where the new centre line crossed as shown marked C was established by calculation and work was begun at this point up and down.

Points on the Base Survey were then chosen at D, E, F, G, H, I, and J, and a start made to clear, through old workings, a way for survey, into the locus of the new deep centre line. The rough distance these places had to be driven was scaled and when nearing the centre line, calculation for true position was

Stations	Deflection Angle R. or L.	Magnetic Bearing	Calculated Bearing	Vertical Angle	Slope Distance in feet	Horizont. Distance in feet	Latitude	Departure	TOTALS N	TOTALS S	TOTALS E	TOTALS W	Station.
W. - Pu.	Base line		S 86° 49' W.										Pu.
Pu - N°1	L 92-47'		S 5°-83 E.	—	192·20	192·20				85·90	4127 15		N°. 1
N°1-300	L 3°-31		S 9°-29 E.	—	106·90	106·90				192·69	4132·15		300
300-N°2	R 3°-24		S 6°-05 E.	—	123·37	123·37	122 67	13·07		315·36	4145·22		N° 2
2 - 3	L 23°-55'		S 30°-00 E	1°-38'	103·80	103·75	89·85	51·87		405·20	4197·09		3
3 - 4	L 24°-43'		S 54°-43' E	2°-27'	1766·70	1764·93	1019·46	1440·71		1424·65	5637·80		4
4 - 5	L 53°-4-30'		N 72°-12'-30" E	3°-30'	69·50	69·36	21·19	66·04		1403 46	5703·84		5
5 - 6	L 5°-7		N 67°-5'-30" E	4°-00'	533·35	531·96	207·07	490·00		1196·39	6193·84		6
6 - 7	No Angle		N 67°-5'-30" E	4°-38'	1244·5	1240·89	483 02	1143·02		713 36	7336·86		7

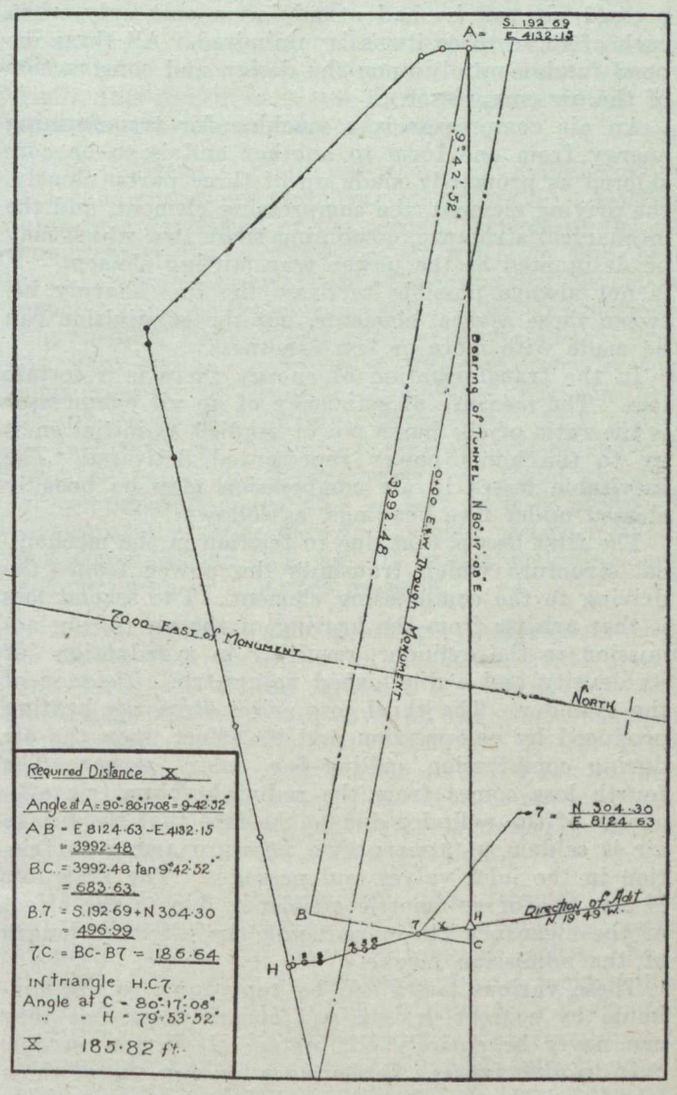
Sample page from Note Book.

made by fixing a direction along the line of adit and solving the triangle for distance along the adit in the fixed direction, for the point of intersection with the tunnel centre line. Possibly the establishing of these intersection points warrants the accompanying illustrative diagram.

In addition to the intersections fixed for intermediate working points, a tedious survey was made across to the old north side and in an old angle deep below the lodgement, to an intersection with new centre line. This deep was partially standing and advantage was taken of this to carry a survey in here for the purpose of intercepting the closure between points I and J, and thus proving the correctness of the work that would be done up to this point. It is interesting to note that the centre line ultimately passed 1¼ inches north of this point—marked K on the accompany plan. It may be noted here that the position J as found was in the old workings in the coal. The tunnel overhead at this point about 12 feet; in process of dropping to meet the coal. When J on centre line was found, the roof was blown down until the grade of the tunnel was reached, and the work prosecuted up and down as before.

The position at which each place broke through is indicated on the accompanying plan and also the amount of error in alignment. It is to be noted that the greatest error in alignment occurred between points only 700 ft. distant one from the other, and, that almost perfect checks were made at other connecting points much further apart. The most satisfactory connection made being between the points furthest apart, in other words, between I and J a distance of 2,300 feet, where the established centre line in each place met on a plug 3" in diameter, the error being about 2½ inches.

While it is evident that the number of places worked and consequent cutting down of distances to the various points of connection kept possible errors within reasonable bounds yet the smallness of these errors was a source of satisfaction and congratulation, and indicated as stated at first, that an important survey may be undertaken with ordinary field equipment, and in the



over all, unavoidable personal errors will more or less eliminate themselves in the end. The instruments used were Gurly Light Mountain Transits, tried daily for adjustments of colimation and level.

Some Elements of Economy in Air Compression

By WM. CARTER, A.M., A.S.M.E.

Second only to electricity in the extent and diversity of application, compressed air is one of the most important agents in every phase of the development of civilization. In the arts, sciences and manufactures, its use has wrought economies which could otherwise never have been realized. Compressed air appliances have exercised an influence upon improved standards of living, second to no other means of power transmission and application. Wherever properly applied, they have brought about economic results which are reflected in every field of activity. But the efficient application of compressed air presupposes an efficient source of compressed air. The most economical devices cannot work to advantage under a high cost of power.

The cost of compressed air for whatever purpose or however produced, involves three separate items: —first, interest and depreciation on the investment for compressing equipment; second, cost of operation; third, cost of maintenance or up-keep. Extravagance in any-one, will offset savings in the other two. Compressed air can be had at minimum cost only when each of these three items is minimized. All three depend fundamentally upon the design and construction of the air compressor.

An air compressor is a machine for transforming energy from one form to another and is to be considered as promarily made up of three parts, namely, the driving element, the compressing element, and the mechanical structure, combining these two which may be designated as the power transmitting element. It is not always possible to draw the line sharply between these several elements, but the subdivision can be made with more or less exactness.

In the transformation of energy there is a certain loss. The measure of efficiency of an air compressor is the ratio of the horse power applied as initial energy to the horse power represented delivered. The inevitable losses in air compression may be broadly classed under five headings, as follows:

The first loss is that due to friction in the mechanical structure which transmits the power from the driving to the compressing element. The second loss is that arising from the heating of the air during admission to the cylinder, resulting in a reduction of its density and a diminished volumetric efficiency of the cylinder. The third loss arises from the heating produced by compression and its effect upon the air during compression, calling for more power. The fourth loss comes from the reduced volumetric efficiency of the cylinder due to the fact that the intake air is seldom at atmospheric pressure owing to friction in the inlet valves and passages. The fifth loss is also one of volumetric efficiency due to the effect of the clearance air in reducing the effective length of the admission stroke.

These various losses can be kept down to the minimum by correct design. and construction, but they can never be entirely eliminated. It is not possible even to give average percentages for any one of these losses, which may occur in different combinations, depending upon the mechanical details, the general type, the speed and the capacity of the compressor. After all these losses have been deducted the net efficiency of the machine remains, and of this Mr. Frank Richards says, "It is safe to say that the ultimate efficiency never goes as high as 80 per cent, while it often goes below 60 per cent.

Taking up now in order the three primary parts into which the compressor has been divided, the driving element comes first for consideration. Air compressors can be broadly defined as either steam driven or power driven.

The ordinary steam driven compressor is simply a steam engine with one or more air cylinders directly coupled on an extended piston rod. With this understanding it will be unnecessary here to enter into any detailed consideration of the design of the steam end. What constitutes good steam engine practice is the best compressor practice so far as the steam end of the compressor is concerned.

However, there is one vital distinction between steam engine and compressor practice. The steam engine for ordinary power purposes must maintain a constant speed irrespective of load. The steam driven air compressor, on the contrary, in order to maintain its output of air properly adjusted to its load, must run at a variable speed, for its piston displacement or its capacity is directly proportional to its speed. This means that while the steam engine has a variable load per stroke, the air compressor has a constant load per stroke, except for the small discrepancy due to varying friction and compression efficiency at varying speeds.

This feature has no particular bearing upon the performance of air compressors with simple steam cylinders, but it has a most important bearing upon the application of compounded steam cylinders to compression work. The first essential of successful steam compounding is in maintaining the proper ratio of expansion. This means that for a given steam pressure, for a given back pressure and for a given cylinder ratio, there is one and only one proper point of cut-off for both steam cylinders.

In any given case the first and third conditions must be considered constant, leaving the second condition as the variable which is to be adjusted to meet varying conditions. Where a constant speed must be maintained regardless of load this must be accomplished by change of cut-off; and in compounded steam cylinders this immediately destroys the proper ratios of compression and sacrifices economy. Constant speed practice with compound engines must be a compromise even at the best.

But in the air compressor, where the load per stroke is constant, the cut-off on the steam cylinders remains practically constant and the correct ratio of expansion is maintained over the full load range. The word "practically" is here used advisedly since there is bound to be a very slight departure from perfect conditions to produce the necessary change of speed under varying load. But it will be evident that the air compressor offers the ideal opportunity for securing in highest degree the advantages of steam compounding.

It would appear proper that in steam driven air compressors the first element of economy lies in using compounded steam cylinders, operating under press-

ure which will make the saving worth while. The peculiar operating conditions of the air compressor, just explained, justify compounded steam ends under pressures lower than would be advisable in ordinary engine practice. The largest builders of air compresors are recommending compound steam ends for as low as 80 pounds boiler pressure running condensing, and for 100 lbs. running non-condensing.

The three fundamental advantages of compounded steam cylinders on air compressors may be summarized as follows: Lower fuel consumption and fuel cost, lower cost of boiler feed water, lower cost of boiler plant and accessories.

Turning now to the subject of power driven compressors, they are in general an evolution from steam driven types. They differ, however, from the others in the vital fact that while steam driven compressors are variable speed machines, power-driven compressors are in the vast majority of cases constant speed machines. This makes the problem of regulation quite distinct in the two cases. This point will be taken up more fully later on.

Discussing now the various methods of drive, belt drive is the most common and is always applicable except where a very short center is necessary. In such cases, so high a belt tension is required, that an undue pressure on shaft bearings is produced, manifesting itself in excessive friction, low mechanical efficiency and rapid wear of the bearings. A good rule to follow is that the belt centres should never be less than three or four times the diameter of the larger pulley, and the direction of belt motion should be such as to put the slack on top. Where ample belt center cannot be had, it is much better to go to some other form of drive.

Rope drive is perhaps the next choice, although it is seldom used where the power to be transmitted is small. It is particularly advantageous where short centers only can be had, as the grip of the rope in the grooves gives the necessary pulling power without undue tension and bearing friction. The durability and efficiency of the rope drive depend entirely upon the shape of the rope grooves and upon the use of a suitable number of ropes so that no one rope is under excessive strain.

The use of tighteners, whether for belt or rope is always to be avoided. There may be cases where there is no alternative, but probably were the facts known, they have cost far more than they are worth in the increased repairs and larger power consumption. A recent development by one of the larger builders however, opens up large possibilities for belt drive on close centers without any increased friction. This arrangement involves the use of a floating idler pulley and a very slack belt. The weight of the idler takes up the slack of the belt and increases the arc of contact on the driving and driven pulleys so that the full power is transmitted without any undue strain on the bearings or on the belt itself.

Gear drive and silent chain drive are never desirable and should be used only where the demand for compactness renders them imperative. The best practice places the limit of power for gear drive with a raw hide pinion at 40 H.P..; for gear drive with a steel pinion at 60 H.P.: and for silent chain or herringbone gear drive at 50 H.P.

A very modern development is the direct-connected electric driven air compressor with the rotor of a slow speed motor mounted directly on the compressor shaft. This construction is not applicable to smaller units because commercial conditions limit the price to be paid for a motor and slow speed motor of small power, costs out of all proportion. On moderate and large sized machines, however, this design affords the very highest possible economy in power driven compressors. Recent improvements in air valve movements and in air cylinders design which permit much higher piston speeds than ever before were considered practical, have contributed toward the success of the direct-connected compressor unit of this design. Unless the valve and port areas are very large, the compression efficiency is so greatly reduced at the customary speeds as to off-set the advantages of compactness. The choice of a direct-connected motor driven air compressor therefore, should be determined by an investigation as to whether the compressor had been specially designed for this method of drive or whether it was simply a standard power driven machine specially fitted with a motor. In the latter case, satisfactory results cannot be expected.

The same general remarks apply to the directed-connected water wheel compressor. But as this style of drive is comparatively rare and can be used only where the head and volume of water are exactly right, this condition is not likely to come within the experience of the average engineer.

The problems encountered in a steam cylinder of an air compressor are problems of expansion. Coming now to a discussion of the second element in the air compressor—the compressing element—we find here that the problems are those of compression almost an exact reverse of those in the steam end. In compressing air all of the energy applied is converted into heat. At first glance, therefore, economical consideration consideration would seem to indicate that this heat should be retained during compression. As a matter of fact, however, economical air compression depends primarily upon the thoroughness with which the heat of compression is removed as fast as it is produced. Compressor practice uses one or both of two methods for accomplishing this, namely, water jacketing, and compounding or stage compression.

If the piston of a compressing cylinder could move so slowly that the water in the jacket could absorb and carry off all the heat, it is evident that this jacketing process would save all the work which is represented on the indicator diagram by the areas between the actual compression line and the isothermal curve. But in actual practice a compressor cannot be run so slowly and water jacketing is only a partial solution of the cooling problem.

Temperatures increase with the pressure in the cylinder and it is evident that the advancing piston steadily reduces the effective area of jacket. Near the end of the stroke, when pressure and temperature are highest, very little of the cylinder wall is exposed and the greater part of the cooling area remaining is the cylinder head. This emphasizes the importance of head jacketing and the superiority of those constructions in which the air valves are not in the heads, thus affording the largest percentage of cool head areas.

(To be Continued.)

Special Correspondence

BRITISH COLUMBIA.

Princeton, B. C.

An outline of what has been done and what is planned by the Canada Copper Company in the development of the Copper Mountain low grade, but exceedingly large, deposits was given recently by H. R. Van Wagenen, general manager of the company, before representatives of the Board of Trade of Vancouver and Princeton. The former were finishing a trip through Okanagan and Similkameen Districts of the Province and were being entertained by the latter when Mr. Van Wagenen gave the very interesting talk in question.

Describing the ore of the Company's new property as being not dissimilar to that of the Hidden Creek Mine, Anyox, and of the Britannia Mine, Howe Sound, B. C., Mr. Van Wagenen said that all the plant and equipment essential in the economical treatment of such low grade ore had been provided. A spur railway had been constructed connecting the Mine with the Kettle Valley Railway Co. and the West Kootenay Power and Light Co. was to put in a line for the transmission of power for operation. Labor conditions had interfered with the former work but it now was well underway and as soon as completed the recovery of ore would be started. The power line came in over 105 miles from Greenwood and 165 miles from Bonnington Falls, the source of the power. The necessary equipment was on hand for the Mill to be operated at Allenby. The site of this plant was 5.5 miles from the town of Princeton and 7.7 miles from the mine. Mill construction would mean an investment of about $1,000,000 and the installation would permit the handling of 2,000 tons of ore a day. Units were prepared in such a manner that a daily treatment of 5,000 tons could be arranged for with little additional expense. Already the Company, in preparation for the opening and the placing of its mine on a productive basis, had spent some $2,500,000, and there was no doubt that the aggregate investment, before all work was complete, would run to $3,500,000. With the outlay of the Kettle Valley Ry. Co. and that of the West Kootenay Power and Light Co., the enterprise, when it was in shape to commence making returns, would aggregate somewhere in the neighborhood of $6,000,000.

At the mine employment would be found for between 400 and 450 men. These, with their families, for whom houses are to be built, would constitute a new town of about 700 people. At Allenby the Mill would require 100 to 150 men. As a rule mill men stayed steadily in one place, settling down with their families, so that it might be expected that this would mean another town of some 400 inhabitants.

Copper products, at the present market, would amount to about $18,000 a day. There was a tonnage of 10,000,000 in sight, with an additional 2,000,000 semi-proved, added to which there would be ore at depth. The ore could be dealt with on the gravity system as the tracks and tunnels were below the lowest known ore. This ore would be run down to the Mill and the resultant product probably would be sent to the Trail Smeltery of the Consolidated Mining and Smelting Company.

Trail, B. C.

An appeal was argued recently before the Supreme Court of Canada which is of interest to the mining men of this Province, the principals between the Consolidated Mining and Smelting Company of Canada and Endersy, a farmer in the Trail Smelter District. This is an action brought by the latter against the Company for damages claimed to have been done to his farm, crops and timber by the metallurgical smoke from the Trail Smelter. The case originally was tried before a special jury which found for the plaintiff, the verdict awarding the latter $2,170. The Company appealed to the British Columbia Court of Appeal which upheld the judgment of the lower court. The case then was carried to the highest Canadian court with the same result, the appeal being dismissed with costs.

Ore receipts in gross tons at the Trail Smelter of the Consolidated Mining and Smelting Company, from October 8 to October 14 incl., were 4,148, making the total for the year 266,543 tons. This marked decline is attributable to the strike of metalliferous miners at Kimberley, B. C. The Sullivan Mines, owned by the Company, made no production during the week because of this walk out and there is no indication as yet of a settlement of the trouble as the management refuse to negotiate with the men while they act as an organization affiliated with the One Big Union. On their part the men, hitherto, have refused to repudiate the O. B. U. The Centre Star Mine, Rossland, B. C., another Company property, continues, therefore, to be the banner shipper, having 1729 tons to its credit over the period in question. Of the independent shippers the Black Bear, Rossland, stands highest with 574 tons while the Josie, also of Rossland, which is working steadily, sent 442 tons to the smelter. Other shippers are the Lone Pine, Republic Wn., with 169 tons; the Mandy, Le Pas, Manitoba, with 298 tons; the Quilp, Republic Wn., with 270 tons; the Ruth Cedar Creek, 100 tons; the Alamo, 47 tons; and the Iron Mask, Kamloops, 44 tons.

Nelson, B. C.

The second Relief Mine, one of the promising lode properties of the Erie Camp, B. C., suffered seriously from fire in July, a forest conflagration sweeping over the property and destroying buildings and much of the equipment. A. D. Westby, manager of the Relief Mining Company, who was in Wisconsin, at the time of the fire, has returned and announces that the work of re-building will be started as soon as negotiations for the capital necessary, the success of which is said to be secured, are complete. It is proposed not only replacing what is lost but making the plant more modern. The Relief Mining Company paid $300,000 for the property which has produced in the aggregate some $650,000. Of this mine the Minister of Mines report for 1918 says that the ore is gold-bearing quartz, the gold being recovered by amalgamation and concentration. During that year eighty-five tons of concentrates were shipped to Greenwood Smelter from 1,241 tons of ore treated at the mine. Development work consists of 50 feet blind drift and stoping.

Ainsworth, B. C.

The Colorado Mine in the Whitewater, B. C. has been bonded by Wm. Martin and G. R. Crowe, two financiers of Winnipeg, Man., and the deal is expected to lead to the consolidation of this property with the

old Charleston group, consisting of the Charleston, Keystone and Kingston claims. In 1897 the latter were among the most important properties of the District and with the additional ground will be one of the strongest mineralized areas of the Slocan under development. The Charleston was quite a heavy shipper in 1896-98 but operations ceased because of the low price of silver and since that time only a limited amount of work has been done. A. J. Harris, who has been on the ground under lease, finally was able to show that with the Colorado the Charleston properties promised to become well worth while and that they certainly merited opening up on a considerable scale. The Colorado adjoins the Whitewater and lies between it and the original Charleston group. This summer a crosscut tunnel was started on the Irene, one of the Whitewater claims, for the purpose of tapping an ore body on the Colorado. The tunnel will be continued this winter. For the present only a small crew will be employed but financial arrangements already have been made for purchasing machinery necessary to permit much more extensive operations next spring.

Victoria, B. C.

Hon. Wm. Sloan and other representative mining men of British Columbia have been invited to attend the second international mining convention of the Pacific Northwest which is to be held at Seattle, Wn., from March 10th to 13th next. Glenville A. Collins has been appointed permanent Convention Chairman and Moncrieffe Cameron is the permanent secretary, both being residents of Seattle. Arrangements already are underway for the assembling of what it is hoped to take the largest and most representative mineral display ever shown on the Pacific Coast. The first International Convention, it will be recalled, took place last year at Vancouver, B. C.

The announcement that Hon. Wm. Sloan, Minister of Mines, propose taking a stand with respect to holders of placer leases in British Columbia who have failed to work the same and moreover have got behind in their rental payments has been received with expressions of approval from the general mining fraternity of the Province as well as from certain mine journals of the Northwest. It is felt, evidently, that the time has come for action of the kind, there being many in the position indicated with the result that considerable placer areas in promising districts are held, without return to the country or to the administration. If the lease holders were required to meet back payments by a specified date or to relinquish their rights there is no doubt that much placer ground at present dormant would be taken up and made to produce.

Change in Management of Premier Gold Mining Co., British Columbia.

A substantial interest in the Premier Gold Mining Company, Limited, which owns the Premier Mine, Salmon River, B. C., Canada, has been purchased by New York interests, and the management will from now on be in the hands of the American Smelting and Refining Company.

The new officers and directors of the Premier Gold Mining Company are as follows:—

President, R. W. Wood, Fernie, B.C. Canada; Vice-President and Managing Director, H. A. Guess, 120 Broadway, New York City; Vice-President, Minor C. Keith, 17 Battery Place, New York City; Secretary, W. E. Merriss, 120 Broadway, New York City; Treasurer, L. A. Chapin, 120 Broadway, New York City.

The Directors are: R. W. Wood, R. K. Neill, W. R. Wilson, H. B. Price, M. C. Keith, W. C. Potter, H. A. Guess.

Mr. R. K. Neill continues as Manager of the company.

Aftermath of Poisoning at Hunker. Widows Awarded by Yukon Gold Company.

The Yukon Gold Company has paid $2,500 to the widows of four of their employees who died from poisoning last May. After a noon meal at the Hunker Company's boarding house at Hunker many of the men become seriously ill and twelve of them died. Another widow whose husband was not employed by the Company but who was boarding at the Company's mess has been paid $1,000.

It was not clear whether this case came under the Workman's Compensation Act or not but the matter was satisfactorily adjusted on the Company's making the payment which it did. Manager McCarthy who handled the matter was fair and impartial and stated that he would have been pleased if the way could have been clear to allow even more for the woman who suffered such a great loss.

The men who were taken sick and recovered have been allowed half time by the company for all working time lost and the hospital expense for each victim was borne by the physicians having the medical contract to take care of any patients taken ill while in the employ of the company. The physicians are compensated by a medical fee deducted monthly from wages of the men.

Kirkman Creek Proving Successful.

J. T. Cooley, old time Yukon miner, gives a good report on Kirkman Creek in the Yukon district. He says that the twelve men who have been busy there this season have made good and are facing the winter comfortably fixed. It is expected that a number of others will aid to the Kirkman colony this winter.

Many of the claims which have been staked on the creek have not been prospected and there many others which could be staked. The ground needs prospecting and could handle about 100 prospectors with fair promises that it will all be as good as the ground now producing. Mr. Cooley recommends Kirkman Creek to any prospector looking for something that will leave him at the end of the winter with something to the good.

Silver Strike Babine Lake District.

A total of $1,100 per ton is a pretty fair showing. The following assay is from specimens of galena taken by Arthur Wood from his Silver Fox Group between Babine and Taltapin Lakes, and brought to the Vancouver Chamber of Mines: over 930 oz. of silver, over 1 oz. of gold, nearly 5 per cent copper, and 20 per cent lead. This was taken from a 4 ft. lead.

Mr. Wood has returned with a force of men to operate the property. It is understood that several well known local men are interested with Mr. Wood.

Our Northern Ontario Letter

A number of prospectors have left Cobalt for the scene of the recent discovery of radium-bearing ore in the township of Butt in the district of Nipissing. One party just returned from that district, declares that it appears to hold out fair promise of being an active field, in view of the find being a promising one and on account of the world-wide interest being taken in radium and its tremendous value.

Producing at the rate of upwards of $40,000 every twenty-four hours, and fully manned with efficient workmen, the mines of Cobalt are deriving the maximum benefit from the current high quotations for commercial bar silver. That a prosperous future still lies before the mines of Cobalt is borne out in the fact that a large part of the total output continues to come from high grade ore. At the Nipissing, large deposits of high grade ore are being constantly drawn from, while at the O'Brien a large quantity of ore is in sight which contains close to $5,000 to the ton. At the Mining Corporation a substantial part of the total production comes from high grade ore, while at the Kerr Lake some two-thirds of the total ore reserve is made up of high grade ore. Added to this comes official reports from the Beaver Consolidated that a vein now being opened up is being found to contain considerable ore that contains around 4,000 ounces to the ton. The Coniagas Company will end its fiscal year on October 31st with a production unofficially estimated at upwards of $800,000. Of this, it is learned in usually well informed quarters about two thirds may be found to be net profit, and at least indicates a fair surplus over dividend requirements of 2½ per cent annually, or some $400,000. On October 25th the company disburse a 2½ per cent dividend, the fourth to be paid this year. This brings total disbursements up to $9,640,000 since 1907.

Rumors persists to the effect that the Temiskaming Mining Company may reasonably resume dividend disbursements in the near future. This belief is supported by the fact that the latest report of the company showed a surplus of some $922,000. Added to this is an official statement made to your correspondent that the company has operated during the current fiscal year at a profit. This would tend to indicate that the surplus may be nearing the million dollar mark and that dividend disbursements are justified. On the Gans lot, according to official advice, some rich patches of ore are being encountered. Master in Ordinary Roche, at Osgoode, Toronto, has signed the formal legal order directing the liquidators of the Bailey-Cobalt Mines to proceed immediately to transfer the Bailey Mine and its assets on the terms of the offer made by A. J. Young.

It is said that the papers for the incorporation of the new company which is to be known as the Bailey-Northern Customs, Limited, are already being prepared and that the transfer should be completed in time for the new company to commence operations on the Bailey before the end of November, or at least as soon as the legal details are properly carried out.

Under the terms of the offer which the Court has accepted, the present Bailey shareholders will receive one share of stock in the new company for each ten shares of their present stock. The capitalization of the new company will be $1,250,000 with $50,000 in the treasury. This treasury insures the shareholders that the property can be actively operated, and the property soon placed on a producing basis.

The Tretheway-Cobalt is reported to be seeking financial aid in carrying out the development of the Castle property in the Gowganda district. The Trethewey has an option on 51 per cent of the stock of the Castle and receives shares in the company as compensation for money spent on the property. It is stated unofficially that some $80,000 worth of ore has so far been developed, and also that the Temiskaming or the McIntyre may be invited to share in its development. The report is supported in that J. P. Bickell who is president of the Temiskaming as well as the McIntyre is interested in the remaining 49 per cent interest in the Castle.

At the time of writing your correspondent finds much speculation among mining men as to what affect the present peculiar situation at Toronto may have on the Department of Mines. The members of the Provincial Parliament from the precious metal mining districts are of the old political schools, Conservative and Liberal, and at the time of writing appear to be likely to be excluded from the governing body, the farmer members. The situation presents the possibility of the voice of the citizens of this district going unheard. The general opinion, however, appears to be that nothing serious will result, and that there is not cause for undue alarm.

The Nipissing Extension mine, formerly the Farah property is being de-watered, plans for its development having been completed. A new vein has been discovered on surface on the eartern part of the property. It has been stripped for a distance of about sixty feet and has an average width of about one inch of smaltite carrying silver values of several hundred ounces to the ton. The wall rock contains considerable leaf silver and is expected to compose substantial tonnage of mill rock. This new find, as well as the one made last June will be followed by aggressive work. Major E. H. Birkett is in charge of operations.

In the Elk Lake district interesting developments are taking place. The most important is that of the White Reserve mine, in the Maple Mountain section of the district where a recent surface discovery of high grade ore has been made. A pit has been put down about 15 feet and some very spectacular ore taken out. In the meantime, a crosscut at the 140 fet. level is being driven for the purpose of tapping the new vein at that depth. As a result of previous work at the property, about twenty veins have been discovered. About 1,100 feet of lateral work has been done at the 140 ft. level. The property is equipped with a nine-drill compressor and corresponding equipment. At present two machines are working.

The Paragon-Hitchcock at Elk Lake is working, and encouraging results at the 200-ft. level are reported. A vein close to two feet in width is being explored.

It is contended by mining men who have had previous experience in both Cobalt and Elk Lake, that the latter district presents favorable possibilities of successful mining developments due to the similarity of geological conditions in Elk Lake as compared with conditions in Cobalt. It is stated that the knowledge gathered during he course of fifteen years of mining on Cobalt may be expected to be used to good advantage in the Elk Lake district.

In Gowganda a number of properties are being explored. For the greater part they all turn to the history of the Miller Lake-O'Brien for inspiration. This is the one successful mining operation in the Gowganda district, one of the richest deposits of silver in the world having been opened up and from which the company has recently been producing silver at the rate of over a million ounces annually. For a time, in its early days, the Miller Lake O'Brien appeared to be a doubtful proposition, and was only developed successfully by reason of Senator M. J. O'Brien refusing to give up, so to speak, and carrying out the exploration of the property from his private fortune. Other operators in the district, are often found pointing to this precedent, and express the thought, which is an offspring of the hope that history will repeat itself in Gowganda.

In the South Lorrain area, the Pittsburg-Lorrain and the old Keeley mine are the only active properties, although here, as well as at Elk Lake, an early revival of activity is being optimistically predicted.

In the gold mining camps satisfactory progress is being made, and there are now a greater number of operating mines than at any previous time during the past two years.

It is intimated that the Hollinger Consolidated will be a heavy purchaser of Victory Loan 1919 bonds. The present surplus of the company is well over three and a half million dollars of which close to two million is made up of bonds of previous loans. It is understood some of this may be converted into the new loan and that a substantial amount will be added to the total. The shortage of labor is still a retarding factor at the Hollinger, the arrival of Fall not having brought men in desired numbers. However, November and December are the two months that are looked to to bring the desired change and thus make it possible to prepare to operate at full capacity instead of less than two-thirds as at present. Although officials are reticent regarding the matter, current rumors tend to indicate some possibility of the Moneta property being taken over by one of the producing mines. It is reported unofficially that both the Hollinger and the Porcupine Crown have exhibited a desire to secure the property. The Moneta adjoins the Millerton side of the Hollinger on the west and seems to present fair possibilities of having the westward continuation of some of the ore bodies found on the latter. As to this, of course, only exploration and development work can determine.

The Dome Mines has recently been able to increase its capacity to about 1000 tons daily, thus handling twice the volume of the McIntyre and about two-thirds as much as the Hollinger. During one day, which was the exception, some 1,500 tons of ore was hoisted. It is plainly evident that the Dome is getting back into its stride in record time. If, with a little under 300 men employed, the Dome is able to handle 1000 tons of ore daily no further evidence is necessary to show that costs of operation are being held well with in bounds. For instance, a larger force of men is engaged at the McIntyre-Porcupine where an average of but 500 tons is treated daily and where costs are held down to around $5 to the ton.

Mr. R. E. Hore has returned to Toronto after examining properties in the Shining Tree Gold district. Mr. Hore was recently in Butt township to see the radium ore deposit discovered by Mr. Elliott.

Bullion Shipped From Cobalt.

During the week ended October 24, six Cobalt companies shipped an aggregate of eight cars containing approximately 576,213 pounds of ore.

Following is a summary:—

Shipper	Cars.	Pounds.
Buffalo	2	175,965
Nipissing	2	149,637
Coniagas	1	65,611
Dominion Reduction	1	65,000
La Rose	1	60,000
Peen-Canadian	1	60,000
Totals	8	573,213

During the corresponding period the Nipissing and the Mining Corporation each made bullion shipments the total amounting to 179,102.88 fine ounces, as shown in the following summary:—

Shipper	Bars.	Ounces.
Nipissing	76	101,048.65
Mining Corporation	79	78,054.23
Total	155	179,102.88

Annual Meeting of McIntyre-Porcupine Mines.

The annual meeting the shareholders of the McIntyre-Porcupine Mines was held on October 24th in Toronto when encouraging reports were received. While no definite statement was forthcoming as to an early increased divident to the shareholders. President J. P. Bickell said that the company's earnings had improved during the four months since the close of the fiscal year and if no unforseen difficulties arose, it looked as if the net earnings for the year now entered upon would be twenty-five per cent above the earning for the year covered by the last report. A surplus was being a accumulated and if that kept on increasing the board would be justified in increasing the distribution of profits. A by-law was ratified reducing the membership of the board from 7 to 5. The five directors previously serving were then re-elected which meant that the places of the late George E. Drummond of Montreal and E. F. B. Johnston of Toronto were not filled. Officers from the mine reported that the shaft is now down 1,500 feet and cross-cutting will now be begun for the 200 feet to reach the vein. The mine is now opened up on the 1,125 foot level.

Development of White Reserve.

Reports from the North say that the White Reserve property in the Maple Mountain section of the Elk district is undergoing considerable development, a vein recently opened showing some very promising silver. The White Reserve Mine is controlled by J. A. McAndrews of Toronto, who was associated with the Abitibi Pulp and Paper Company in the early days of that enterprise. Mr. McAndrews predicts a prosperous future for that area, including the Darby Lake and Skull Lake district. The mine is situated close to the cast boundary of the township of Whitson and is about five miles northwest from Lady Evelyn Lake.

Exploring the Kennedy Group.

A report from Boston Creek states that a new company is being formed for the purpose of developing and exploring the Kennedy group of claims on the boundary of Boston, while arrangements are proceeding for the development of the Hohenaur property at Kirkland Lake. On the Mondeau property now known as the Peerless work has proved to be sufficiently encouraging to proceed with the installation of a more powerful mining plant.

To Develop the Boyce Claims.

Announcement is made that the old "Boyce group" of claims in the Porcupine district has been sold to strong Canadian financial interests in Toronto, Hamilton and Montreal. The deal was arranged by A. S. Fuller of Timins, Tanner, Gates & Co Toronto and J. R. Starnes, Montreal. The property will now be known as the Gold Centre Mines, Limited, a $3,000,000 corporation having been formed for taking over the claims. There are five claims adjacent to the Hollinger Consolidated, the McIntyre, Dome and West Dome.

Progress at the Clifton Mine.

Homer L. Gibson and a party of twelve returned to Toronto on Sunday last after several days spent on a visit of inspection to the Hollinger, Dome and Clifton Mines. The latter mine is a prospect on which developing work is just starting. The operating company has now 25 men undreground and has just completed the installation of an electric plant in order to work the 500 foot level. Mr. Gibson states that ore has been found in three veins at the first level. At the Dome Mine the party found the labor situation greatly improved and the indications are that during the winter an adequate force of help will be available.

STOCK PROMOTIONS DISCREDITING WEST SHINING TREE GOLD AREA.

Regarding the West Shining Tree gold area about which much has recently been written, and more said, the writer has consulted the opinion of two of the leading geologists of the Dominion—recognized as such by mining men of the highest standing, and as a result feels assured that an unbiased summary of the situation is this:

The geological conditions of West Shining Tree are such as encourages the belief that commercial deposits of gold ore should be found in that area. There may not be a certainty of this, but there are at least excellent possibilities. One geologist pointed out that he felt optimistic over the camp's future, and that he had found it necessary to disregard the numerous stock promotion schemes in order to become optimistic. In the opinion of both geologists, the present situation appears to be attended with possibilities of the camp falling into bad repute, getting a black-eye, so to speak, and in a sense throwing the whole thing into "near-liquidation." This, not due to lack of merit or potentialities, but due to some of the properties being saddled to, and subject to the greed of a few men who are playing the stock end of the game.

"I am optimistic about the potentialities of West Shining Tree, and, in this, am anxious to compare notes with other mining geologists," said one of the gentlemen interviewed. "In the Porcupine camp," he said, "we all know how easily the area which now comprises the paying mines could have been missed if effort had ceased with such early discoveries as the Rea. I am optimistic about Shining Tree, not that I feel certain that mines have already been found, but in the hope that owners of claims will remove a little more moss, expose a little more rock and perhaps as a result make more important discoveries than those already made."

In the gold mining camps of Northern Ontario the propositions in which brokers have played a leading part have practically all landed in the scrap heap. It is a broad statement, but it is true. The profitable operations do not owe their success to the brokers. In their order of importance they may be cited: First, the Hollinger is the product of the optimism of the Timmins Brothers and their Montreal and Toronto associates; second, the Dome, is the product of first the Mond Nickel Company, and later Mr. De Lamar; third, the McIntyre became successful owing to the efforts of the late Col. A. M. Hay; fourth, the Lake Shore was brought to a profit-producing basis by Harry Oakes, the proposition being adversely criticised by disgruntled stock brokers because they were refused the opportunity of using the Lake Shore as a means of fleecing the public; fifth, the Porcupine Crown won success through the efforts of the Crown Reserve Mining Company.

If some system could be devised whereby the brokerage houses, or a great many of them, could be prevented from exhibiting unreasonable greed, and permitted to devote themselves earnestly to the work of soliciting capital to be used in the exploration and developing of mining prospects, the mining industry of this country would be greatly benefitted. To this end it would be necessary to limit the amount of commission which the brokers might charge for selling unlisted stocks. As matters now stand, they are permitted to underwrite stock at perhaps 10 cents a share and sell it at 20, 30 cents or whatever they are able to get. Instead of the money finding its way to the treasury, everything above the underwritten price goes to the broker, sometimes amounting to more to the latter than to the treasurer. Such, of course, quite obviously reduces the chances of developing mining property successfully. When the difficulty, under favorable conditions, of developing mining property from a raw prospect to a dividend-paying mine is considered, it is indeed small wonder that so many of the propositions with which the broker is associated and gets his "hand-out" should fail—hence the fear that the promising West Shining Tree camp is saddled with a condition that will ultimately be found to have done it an injury.—J. Mc.R.

The remark, we so often hear, "Ore is where you find it," always reminds me of the old Cousin Jack (Cornishman) tributer, when asked how his 'pitch' was looking, who said: "Thee knows 'ow they bloody h'ore ez, me son, sometimes ez 'eer and sometimes theer, and weer 'ee edden, theer be oi." In plain English, "You know how ore is, my son, sometimes it's here and sometimes there, and where it isn't there am I." I claim that to be pretty pat.—Extract from a letter to the Editor of M. & S. Press.

Considerable interest is being taken in Nigeria in a new discovery of silver-lead. There is a highly-mineralized belt of about 50 miles in length, and ore bodies have been located up to a width of 50 ft.

Nova Scotia Notes

It is announced the Dominion Steel Corporation has subscribed $25,000 to the erection of a general hospital to serve the Town of New Waterford and the surrounding district, where the Dominion Coal Company has now five collieries in operation. The present hospital, which is only a temporary arrangement, is quite inadequate, and the need for a larger hospital has been long felt. The revenue for the work of the Hospital will be derived, as is customary in the Glace Bay district, from monthly contributions by the colliery workmen, from provincial and municipal grants donations from the colliery companies and private subscriptions.

The Dominion Coal Company has recently equipped and opened a clubhouse for its officials at Glace Bay. The club is handsomely furnished with library, billiard-room and the usual club appointments, including a ladies' section, and provision for meetings and official dinners.

The Dominion Coal Company, according to newspaper reports, contemplates immediate operation of its areas in the North Sydney field from Bonar Head, contiguous to the workings of the Nova Scotia Steel and Coal Company. This report would appear to indicate the unlikelihood of any amicable arrangement between the Dominion and Scotia companies for the partition of areas in this locality.

It is announced that a zinc-copper-lead property held under lease by James Nolan of Glace Bay has been placed under option to Capt. P. J. Webb of Sydney, who is endeavoring to dispose of the property to American interests.

The leases cover areas near Stirling, Richmond County, Cape Breton Island. Some $40,000 has been expended in proving the property, and it is stated that ore of good quality has been exposed along the general direction of strike for about 1,000 feet, showing a width in one trench of 66 feet. Analyses of the ore are said to have shown 33 per cent zinc, 13 per cent lead, 3.68 per cent copper, with important yields of associated gold and silver.

The following account of this mineral occurrence is contained in the Summary Report of the Geological Survey for 1918, part F, by A. O. Hayes.

Stirling, Richmond County. — Descriptions of the development work on the Stirling zinc-lead-copper deposit previous to 1918 were published by D. D. Cairnes [1] and A. O. Hayes [2]. No development work was done from July 17, when the Stirling Exploration Co. stopped driling to July, 1918 when the New Jersey Zinc Co. commenced operations under an option to purchase from the original lessee, James Nolan of Glace Bay. J. T. Boyd is in charge of the present development work by which it is planned to prove the deposit at a greater depth than accomplished by the Stirling Exploration Company in 1917. Five calyx drills removing 3-inch cores were in operation, putting down holes at 35 degrees from the vertical. The drills were placed east and west of the line of extension of the deposit and boring carried on from opposite sides. The gangue, which varies from dense quartz to somewhat porous carbonate schist, offered great difficulty for the type of drills used and progress was, therefore, made more slowly than anticipated.

The drilling in 1917 indicated an impoverishment of the ore both laterally and in depth from the principle showing illustrated as Trench C in D.D. Cairnes' summary report [1] for 1916. Towards the south there is a heavy overburden of boulder clay and surface trenching is impracticable. The drilling 400 feet south of Trench C showed no ore, whereas 200 feet south of French C the ore-body was much smaller than the holes drilled under the principal showing, which also showed gradual impoverishment to a very low grade ore between vertical depths of 200 to 350 feet. Surface trenching at intervals to the north of Trench C shows a splitting of the higher grade ore into narrow bands which terminate entirely about 500 feet north. A hole drill hole placed about 200 feet north of Trench C shows similar characteristics at depths of 150 to 300 feet vertically with low grade ore predominating.

In September 1918, a boring on the west side of the known deposits entered ore, indicating the presence of another band. The lenticular form and magmatic source of the ore suggests the probability of the occurrence of additional related ore, both laterally and in depth.

The country rock consists of a volcanic series of pyroclastic rocks and lava flows of rhyolite and trachyte, with interbanded carbonates of lime magnesia and iron, apparently alterations of the volcanic rocks. These are intruded by plutonic rocks consisting of diabase, quartz porphyry, and a porphyrite. There is also a dyke of mica diorite cut in a diamond drill hole at the south end of the ore-body and in a trench at the north end of the ore-body a similar dip is about 10 feet thick. This dyke was not encountered in any of the other drill holes, although they penetrated the intervening formation; therefore, two different dykes may occur. Although no large exposure of this rock was found in the vicinity of the workings, a similar intrusive plutonic rock occurs in large quantity, cutting a similar volcanic series, on the coast west of Seal rock between Framboise and Capelin cove about 5 miles south of Stirling.

The whole series has undergone metamorphism accompanied by shearing with the development of a schistose structure, having a strike of north 31 degrees east (astronomic) with steep easterly dip. The ore appears to lie along one of the shear zones. The ore consists of a fine-grained, intimate mixture of the following sulphides in order of their abundance; sphalerite, pyrite, galena and chalcopyrite, containing small amount of gold and silver. The ore varies from high grade, consisting of an almost solid sulphide mass accompanied by a small amount of gangue, principally calcite with subordinate quartz, to low grade, largely calcite with some quartz, containing a small amount of the sulphides disseminated through it in small masses. In the lower grade ore there is a greater proportion of pyrite to total sulphide contents, than in the higher grade ore.

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[1] Geol. Surv., Can., Sum. Rept., 1916, p. 255.
[2] Geol. Surv., Can., Sum. Rept., 1917, pt. F. p. 30.
[1] Geol. Surv., Can., Sum. Rept., 1916, Fig. 11, p. 257.

THE APPLICATION OF PULVERISED COAL IN BLAST FURNACES.

The Canadian Mining Institute Bulletin for July contained a description of the progress made in using pulverised coal in blast furnaces which made the following references to the smelting of iron:

History of Early Attempts.

"The use of pulverised coal in reverberatory furnaces, cement kilns, open hearth furnaces, boilers and other similar furnaces, has been dealt with extensively in many papers and publications; the present paper on the other hand will be confined to the application of pulverised fuel to blast furnaces, wherein the mixture of fuel and air is injected into the lower portion of a piled mass of material, and combustion takes place under pressure.

Until recently the history of pulverised coal in blast furnaces contained nothing but records of failures. Sir Lowthian Bell, in his book on the "Principles of the Manufacture of Iron and Steel" published in 1872, which deservedly ranks among the world's metallurgical classics, mentions an attempt to introduce finely divided coal with the blast at the tuyeres in an iron furnace; the attempt was soon abandoned, and Bell remarked that it needed but little consideration to insure rejection of all such schemes.

About 1902, Mr. W. J. Forster of Darlaston, England, satisfied himself by a great number of experiments at the Darlaston furnaces: "That nothing but failure can be expected from the addition of cold materials into the hearth of the furnace with the blast."

Possessed of this opinion, Mr. Forster suggested the use in the blast furnace of a specially prepared carbon obtained by heating solid carbon to a very high temperature, so that all volatile matter and moisture should be expelled and the carbon should be strongly heated before its use in the blast. He obtained British and American patents on the expedient of so preparing carbon and introducing it with the blast, whereby he hoped to make special grades of iron. The idea seems to have produced no effect upon the art of smelting iron, but it may be considered to illustrate the rest of the history of the use of pulverised fuel in blast furnaces as this history consists of sundry comparable suggestions of expedients all of which have, so far as known, failed to meet with practical success. The efforts to use successfully pulverised fuel in iron blast furnaces have embraced such expedients as the substitution of heated gas, with and without superheated steam, for some or all of the air; the careful classifying of the fuel into different and distinct sizes with a view to employing the finer grade to create a high initial temperature to ignite the rest; the substitution of an annular reverberatory arranged around the base of the charge, and the injection tangentially thereinto of the powdered coal and air; the grinding and mining of the charge itself so that the particles might fall through a stream of burning fuel and air, and so on. It is not profitable for present purposes to consider all these expedients or the various patents which have been granted on them, because, so far as is known, none of them has been sufficiently successful to secure adoption.

The results obtained by the recent work which we shall now describe have been attained not so much by resort of extraneous expedients as by the development of the combustion process itself. The chemical phenomena of combustion are relatively little known, although they have been made the subject of important research work by numerous scientists since the days of Bunsen, who, in 1845, made investigations on a coal-fired blast furnace used for the smelting of iron ores; and it is impracticable, within the limits of this paper, to discuss these phenomena in detail. The phenomena apparently embrace distillation of volatile matter, gasification, and combustion. When a mixture of air and finely divided fuel is directed into and against a mass of more or less refractory material, different results may ensue, according to variations in a multiplicity of factors. The work to be described seems to demonstrate that by proper provision of suitable space for combustion, maintenance of correct air pressure and fuel within the combustion space, it is practicable to develop within the charge a sort of supercombustion, which provides at greatly reduced cost the heat necessary to bring the charge to a molten condition. It is particularly difficult to generalise or define the possibilities or limitations of the generation of heat in a blast furnace so operated, for much depends upon the physical and chemical characteristics of the charge, as well as upon the variable factors directly entering into the combustion."

The authors suggest that a better idea of the work can be obtained by concrete illustration, and proceed to describe in great detail the experiments of Mr. Garred in a field which, the authors believe has heretofore been untouched even by suggestion, namely, the melting of copper and the smelting of copper ores.

At the plant of the International Nickel Company the most recent work has been to operate the furnace entirely without coke, following earlier work where an average of fifty per cent of the coke had been replaced. The results, with all coke eliminated, are sufficiently encouraging to continue the experimentation with this object in view.

The processes involving the application of pulverised fuel to blast furnaces have been patented in the United States, Canada, and many foreign countries; the patentees, Garred and Cavers, both being engaged in work connected with the smelting of non-ferrous ores, and both were simultaneously working on practically the same problem, of the combustion of finely divided fuel in a blast furnace. Owing to the magnitude of the problems involved, a consolidation of their interests was effected recently, by the formation of the Garred-Cavers Corporation, New York, which company has acquired the patents issued and pending in connection with this work. It is expected that experiments on the smelting of silver-lead ores will be commenced in the near future, and there is every reason to believe the prospects are good for increasing the efficiency of blast furnace practice.

During the last few years, some twenty to thirty million tons of non-ferrous ores per year have been treated in blast furnaces in the United States, Canada and Mexico, and it is believed that further developments of a satisfactory nature in connection with this work will enable a large proportion of these ores to be smelted with considerable economies in fuel.

The Garred-Cavers Corporation has made contracts and issued licenses for the use of its process by the

International Nickel Company of Canada, the Tennessee Copper Company and Cerro de Pasco Copper Corporation. Mr. W. J. Hamilton is Consulting Engineer to the Cerro de Pasco Company and arrangements have been made to utilize pulverised coal in the existing blast furnaces at the smelter, but also in a new smelter to be constructed by that Company.

While the application of pulverised coal, in its present development, does not extend to the smelting of iron in the blast furnace, it does not appear unreasonable to expect that the lessons learned from its use in non-ferrous smelting may lead to a wider application that may some day include the reduction of iron ores.

PERSONALS.

Mr. J. B. Tyrrell, accompanied by Mr. P. A. MacDonald, Public Utilities Commissioner of Manitoba, Mr. Phillips and Mr. McTavish, left Winnipeg recently to make an examination of the Gold Pan Mine in the Rice Lake District.

Mr. J. B. Tyrrell addressed an open meeting held in the Fort Garry Hotel, Winnipeg, under the auspices of the Manitoba Branch of the Canadian Mining Institute. The subject of the address was "The Mining Situation in Its Relation to Manitoba." Having recently returned from an extended trip through Northern Manitoba, Mr. Tyrrell was able to entertain his audience with an authoritative account of the mineral possibilities of the Province.

The Prince ready to go underground at the O'Brien Mine, Cobalt.

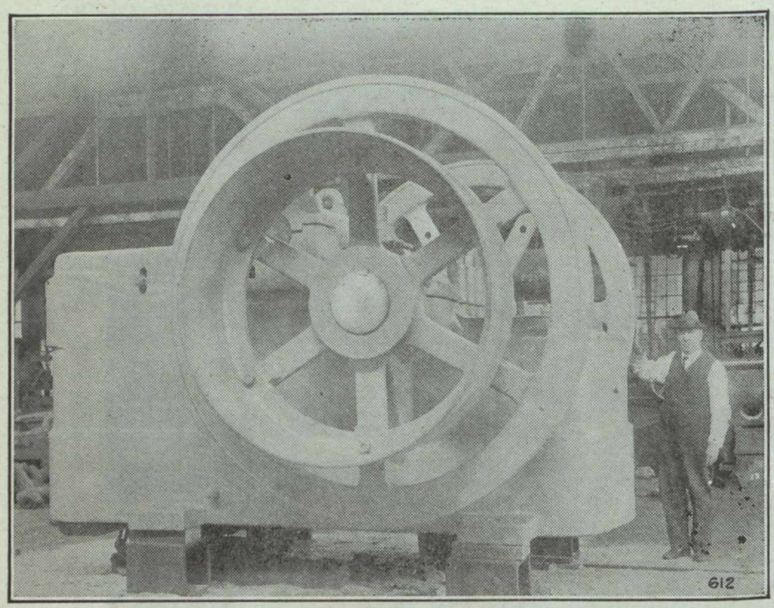
Mr. Hughes, the Prime Minister, has stated in the House of Representatives of the Commonwealth, that the Imperial Government had promised to advance £500,000 for the purpose of fostering the treatment of spelter in Australia, and the Commonwealth would also assist in the establishment of similar works.

Arrangements are being made by the Manitoba Branch of the Canadian Mining Institute for a lecture to be given by Dr. R. C. Wallace, Commissioner of Northern Manitoba and Chairman of the Branch. The meeting will be held in Winnipeg on October 23rd, and no doubt the speaker will deal with some aspect of the mining situation in Northern Manitoba.

LARGE ROCK CRUSHER BUILT IN CANADA FOR THE ASBESTOS CORPORATION.

One of the largest rock crushers in Canada has recently been installed at the British-Canadian Mines of the Asbestos Corporation of Canada, Limited. The bulk of the machine is clearly indicated by comparison with the man standing beside the rock crusher. Larger crushers have, of course, been built; but as a rule for special purposes, and not as far as the writer is aware, by any Canadian firm.

The general dimensions of the crusher are as follows:
Size, 42 ft. x 36 ft.
Weight of frame, 78,000 lbs.
Weight of swing jaw with bushing, 21,800 lbs.
Weight of flywheel and pulley, 7,000 lbs.
Weight of Pitman, 4,900 lbs.



Crusher for Asbestos Corporation.

All parts are unusually massive to withstand the heavy strains of crushing the large pieces of rock which this machine will have to handle; jaw and cheek plates are of manganese steel, and the Pitman is of bolted construction instead of being solid as in the smaller types of crusher.

The crusher is intended for primary crushing of the asbestos "mill" rock, and being able to handle comparatively large pieces of rock will effect a saving in the actual mining cost. The crusher was constructed at the Jenckes plant of the Canadian Ingersoll-Rand Company, Limited, Sherbrooke, and is the third of this size supplied to the Asbestos Corporation.

A unique mining plant is located in Ohio. Both coal and sand are taken from the one property which consists of 150 acres. The surface strata is high grade molding sand and has an average depth of about nine feet. It is deposited on a bed of shale about five feet in thickness and under this is a seam of excellent coal averaging from 4 to 5 feet. Shipments of sand already have been made to foundries throughout the country. A considerable tonnage of coal also has been mined. As the shale strata is uncovered by the removal of the sand, steam shovels will be utilized to strip the shale, thereby exposing the seam of coal which will be mined in the open.

A LARGE ROCK CRUSHER.

The modern tendency in mining engineering work is to instal larger and more powerful rock-crushers rather than to multiply the number of those in use. The largest gyratory rock-crusher in the world has recently been laid down, its dimensions being as follows: Height from foundations to the top of the hopper, 17 ft. 8 ins.; diameter of hopper, 19 ft. 6 ins., the length of the shaft, which is 10 ins. in diameter, being 21 ft. The receiving opening are 60 ins. by 190 ins. and the diameter of the rope sheave driving pulley is 7 ft.

The weight of the complete crusher is about 358 tons and it is capable of dealing with from 2,500 to 3,000 tons of rock per hour, crushing an 8-in. or 9-in. product. When running under full load the crusher requires a driving power of about 350 h.p., and it absorbs 75 h.p. when running light. The working parts are lubricated by a forced feed, a pump situated in its lower portion driving a thick oil to all bearings. The oil sump from which the pump draws its supply contains nine barrels of oil, and all surplus is returned through coarse filters to the sump. The crusher in question has been designed and laid down to deal with the output of a number of steam shovels at a big limestone quarry, the material being dumped into the hopper from trucks holding 12½ tons.

THE SILVER SITUATION.

There has been very heavy buying of silver for Far Eastern account. India would buy this country's annual yield, according to well posted silver men, if it were available and still need more. Of late China has been buying heavily, both in New York and London.

The demands of the Far East for silver have many times proved the mainstay of the market for this metal. Just what happens to the great quantities shipped there has never been satisfactorily explained, although silver always figures in trade between India and China and the Western world.

In China silver still is minded into taels or shoes. When troops returned from their participation in the Boxer uprising two decades ago they brought with them quantities of these silver shoes, which were worn for a time as charms.

While there was some interest shown on the part of producers a few months ago in the subject of an export combination the matter seems to have passed from mind. One active producer says: "We are selling all the silver we can produce through banks in New York and are getting good prices. Under the circumstances we fail to see how a combination would be of any assistance."

New York producers have sold silver metal this week at $1.23½ an ounce, the highest price reached in over 50 years. For the most part this metal was taken for shipment to China.—Boston News Bureau.

PURCHASE OF FLIN-FLON MINE DENIED.

The Emergency issue of the "Engineering & Mining Journal" states that a denial has been issued by Hayden Stone & Co. of the reported purchase of that mine by interests connected with this well-known Boston and New York firm.

Manitoba Can Manufacture Briquettes.

Hon. T. H. Johnson, attorney-general, has stated that the successful manufacture of briquettes in the lignite fields of southwestern Manitoba is assured and the plan has proven entirely feasible.

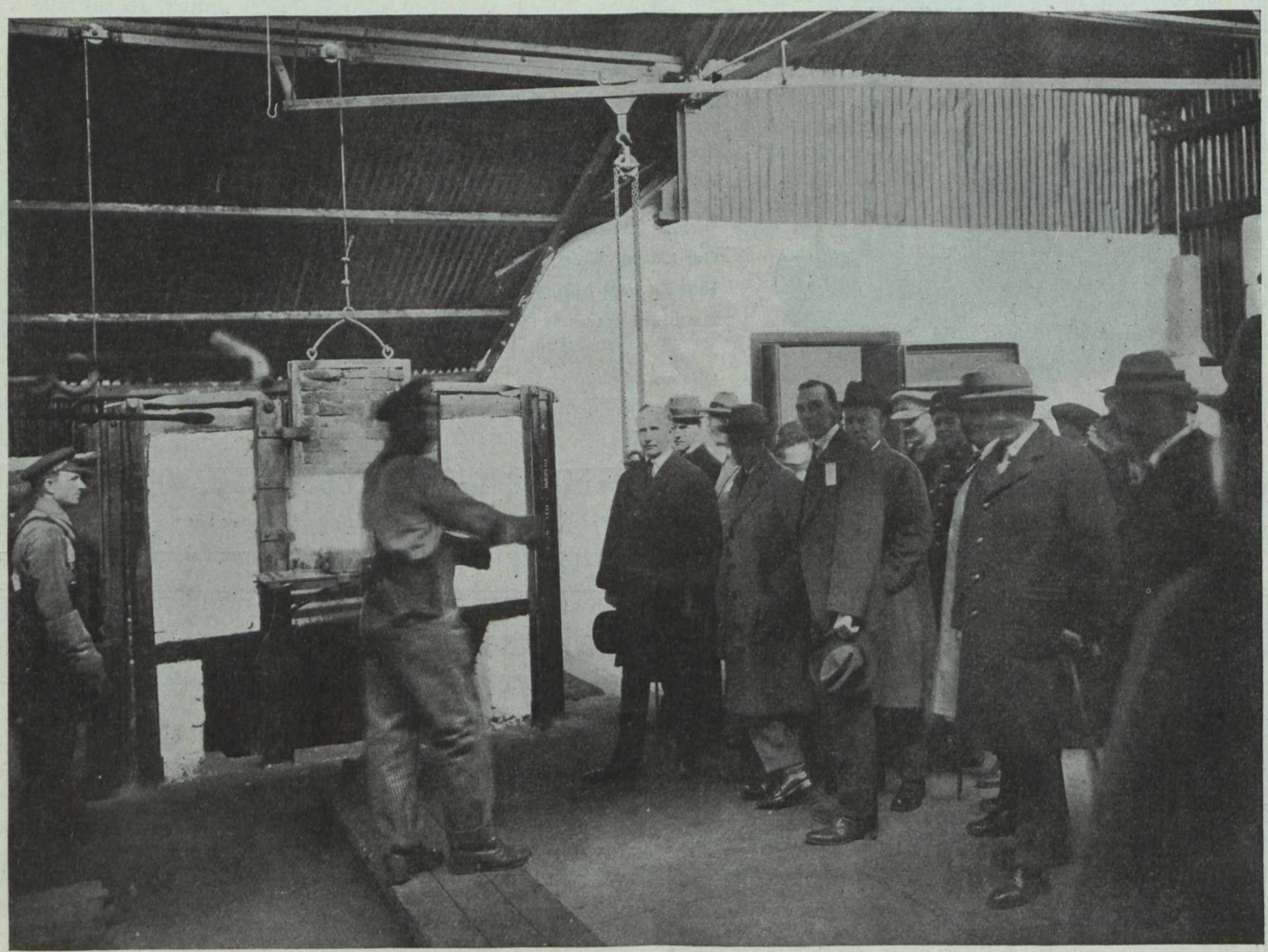
In a recent trip to Ottawa Mr. Johnson was shown over the experimental plant of the lignite utilization commission at Ottawa. He says that the commission was proceeding with plans for the erection of a plant which would produce briquettes on a paying basis and would prove the industry to be a good profit-making enterprise. The briquettes, he said, would be placed on the market in the fall of 1920 and would sell for approximately $10. per ton. They were in every way equal to the American anthracite coal. The commission is being financed by the federal government and the provincial governments of Manitoba and Saskatchewan.

Manitoba to Have Railway to Northern Gold Fields.

On September 30, after having interviewed Hon. Arthur Meighen, Minister of the Interior; Hon. J. D. Reid, Minister of Railways; and Hon. J. A. Calder, Minister of Immigration, regarding the erection of a railway to the gold fields of Manitoba, Premier T. C. Norris announced that surveying for a railway line will start this Fall.

The federal officials have been much impressed with the necessity of developing the mineral resources of Manitoba and have given their assurance that surveying for a railway line, from The Pas to the gold belt about 73 miles north of The Pas, will start immediately.

Railway officials, who have visited the fields since the recent big strikes, believe that railway could be operated at a good profit. The provincial government were considering the advisability of erecting a railway, which will cost about $2,000,000 had the federal government refused to take any action.



The Prince witnesses the pouring of silver bullion at the reduction plant of the Mining Corporation, Cobalt.

The Canadian Miners' Buying Directory.

Acetylene Gas:
Canada Carbide Company, Ltd.
Canadian Fairbanks-Morse.

A.C. Units:
MacGovern & Co.

Agitators:
The Dorr Co.

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

Alloy and Carbon Tool Steel:
International High Speed Steel Co., Rockaway, N.J.

Alternators:
MacGovern & Co.

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

Antimony:
Canada Metal Co.

Antimonial Lead:
Pennsylvania Smelting Co.

Arrester, Locomotive Spark:
Hendrick Manufacturing Co.

Arsenic White Lead:
Coniagas Reduction Co.

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

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

Asbestos:
Everitt & Co.

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

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

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

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

Ball Mill Feeders:
Fraser & Chalmers of Canada, Ltd.
Hardinge Conical Mill Co.

Ball Mill Linings:
Hardinge Conical Mill Co.

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

Belting:
R. T. Gilman & Co.

Belting (Transmission):
Goodyear Tire & Rubber Co.

Belting (Elevator):
Goodyear Tire & Rubber Co.

Belting (Conveyor):
Goodyear Tire & Rubber Co.

Blasting Batteries and Supplies:
Canadian Ingersoll-Rand Co., Ltd
Mussens, Ltd.
Northern Canada Supply Co.
Canadian Explosives, Ltd.

Bluestone:
The Consolidated Mining & Smelting Co.

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

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

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

Bortz and Carbons:
Diamond Drill Carbon Co.

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

Brazilian Rough Diamonds:
Diamond Drill Carbon Co.

Brazilian Mica:
Diamond Drill Carbon Co.

Buggies, Mine Car (Steel)
Hendrick Manufacturing Co.

Brazilian Ballas:
Diamond Drill Carbon Co.

Brazilian Rock Crystal:
Diamond Drill Carbon Co.

Brazilian Tourmalines:
Diamond Drill Carbon Co.

Brazilian Aquamarines:
Diamond Drill Carbon Co.

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

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

Buckets, Elevator:
Hendrick Mfg. Co.

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

Cableways:
M. Beatty & Sons, Ltd.
Fraser & Chalmers of Canada, Ltd.
Mussens, Ltd.
The Wabi Iron Works
R. T. Gilman & Co.

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

Canadian Miners' Buying Directory.—(Continued)

Cables—Wire:
Standard Underground Cable Co. of Canada, Ltd.
Canada Wire & Cable Co.
Fraser & Chalmers of Canada, Ltd.
Northern Electric Co., Ltd.
R. T. Gilman & Co.

Cam Shafts:
Canada Foundries & Forgings, Ltd.

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

Carbide of Calcium:
Canada Carbide Company, Ltd.

Cars:
Canadian Foundries and Forgings, Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Fairbanks-Morse Co., Ltd.
John J. Gartshore
MacKinnon Steel Co., Ltd.
The Electric Steel & Metals Co.
Northern Canada Supply Co.
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
John J. Gartshore
Marsh Engineering Works, Ltd.
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.
The Electric Steel & Metals Co.
The Wabi Iron Works

Cement Machinery:
Northern Canada Supply Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
The Electric Steel & Metals Co.
R. T Gilman & Co.
Burnett & Crampton

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

Chain Drives:
Jones & Glassco

Chemical Apparatus:
Mine and Smelter Supply Co.

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

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

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

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

Coal Cutters:
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.

Coal Mining Explosives:
Canadian Explosives, Ltd.

Coal Mining Machinery:
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.
March Engineering Works
Hadfields, Ltd.
Hendrick Mfg. Co.
Fraser & Chalmers of Canada, Limited
Mussens, Limited
R. T. Gilman & Co.

Coal and Coke Handling Machinery
Link-Belt Co.

Coal Pick Machines:
Sullivan Machinery Co.

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:
Mine & Smelter Co.
Deister Concentrator Co.
The Wabi Iron Works

Converters:
Northern Canada Supply Co.
MacGovern & Co,, Inc.

Contractors' Supplies:
Canadian Fairbanks-Morse Co., Ltd.

Consulters and Engineers:
Hersey Milton Co., Ltd.

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.
Link-Belt Co.
R. T. Gilman & Co.
Smart-Turner Machine Co.
M. Beatty & Sons, Ltd.

Crane Ropes:
Allan Whyte & Co.
Greening, B., Wire Co., Ltd.

Crucibles:
Canadian Fairbanks-Morse Co., Ltd.
Mine and Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries, Limited, Hull, Que.

Crushers:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Steel Foundries, Ltd.
Hardinge Conical Mill Co.
The Electric Steel & Metals Co., Ltd.
R. T. Gilman & Co.
Lymans, Ltd.
Mussens, Limited
Mine and Smelter Supply Co.
Hadfields, Limited
Fraser & Chalmers of Canada. Ltd.
The Wabi Iron Works

Canadian Miners' Buying Directory.—(Continued)

Cyanide Plant Equipment:
The Dorr Co.

D. C. Units:
MacGovern Co.

Derricks:
Smart-Turner Machine Co.
M. Beatty & Sons, Ltd.
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.

Dredger Pins:
Canadian Steel Foundries, Ltd.
The Electric Steel & Metals Co.
Hadfields, Limited

Dredging Machinery:
Canadian Steel Foundries, Ltd.
M. Beatty & Sons
Hadfields, Limited
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.
Sullivan Machinery Co.
Northern Canada Supply Co.
Canadian Rock Drill Co.
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:
Hadfields, Limited
International High Speed Steel Co., Rockawaw, N.J.
Mussens, Limited

Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.
Sullivan Machinery Co.
Canadian Rock Drill Co.
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.
Hadfields, Limited

Dynamite:
Canadian Explosives
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:
M. Beatty & Sons
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.
Fraser & Chalmers of Canada, Ltd.

Engines—Gas and Gasoline:
Canadian Fairbanks-Morse Co., Ltd.
Alex. Fleck
Fraser & Chalmers of Canada, Ltd.
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
Marsh Engineering Works
Fraser & Chalmers of Canada, Ltd.

Engines—Marine:
Canadian Fairbanks-Morse Co., Ltd.
MacGovern & Co., Inc.

Engines—Steam:
Canadian Fairbanks-Morse Co., Ltd.
M. Beatty & Sons
R. T. Gilman & Co.
MacGovern & Co., Inc.
Fraser & Chalmers of Canada, Ltd.

Engineers:
The Dorr Co.

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

Feed Water Heaters:
MacGovern & Co.

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:
M. Beatty & Sons
Canadian Foundries and Forgings, Ltd.
Smart-Turner Machine Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.

Frogs:
Canadian Steel Foundries, Ltd.
John J. Gartshore

Frequency Changers:
MacGovern & Co., Inc.

Furnaces—Assay:
Canadian Fairbanks-Morse Co., Ltd.
Lymans, Limited
Mine & Smelter Supply Co.

Fuse:
Canalian Explosives
Northern Canada Supply Co.

Gears (Cast):
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:
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.
Hadfields, Limited
International High Speed Steel Co., Rockaway, N.J.

High Speed Steel Twist Drills:
Canadian Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.

Hoists—Air, Electric and Steam:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Jones & Glassco
M. Beatty & Sons
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.
The Electric Steel & Metals Co.
Mussens, Limited
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
M. Beatty & Sons
Marsh Engineering Works
Fraser & Chalmers of Canada, Ltd.
The Mine & Smelter Supply Co.

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.

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.

Manganese Steel:
Canadian Steel Foundries, Ltd.
The Electric Steel & Metals Co.
Hadfields, Limited
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.

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:
International High Speed Steel Co., Rockaway, N.J.

Mining Requisites:
Canadian Steel Foundries, Ltd.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works

Mine Surveying Instruments:
C. L. Berger & Sons

Molybdenite:
Everitt & Co.

Monel Metal:
International Nickel Co.

Motors:
Canadian Fairbanks-Morse Co., Ltd.
R. T. Gilman & Co.
MacGovern & 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 Mond Nickel Co., Ltd.

Nickel Wire:
The Mond Nickel Co., Ltd.

Oil Analysts:
Constant, C. L. Co.

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.

Perforated Metals:
Northern Canada Supply Co.
Hendrick Mfg. Co.
Greening, B., Wire Co.

Pig Tin:
Canada Metal Co., Ltd.
Hoyt Metal Co.

Pig Lead:
Canada Metal Co., Ltd.
Hoyt Metal Co.
Pennsylvania Manufacturing Co.

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.

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.
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, Lt...
Mussens, Limited
Mine & Smelter Supply Co.

Pumps—Centrifugal:
Canadian Fairbanks-Morse Co., Ltd.
The Electric Steel & Metals Co.
Smart-Turner Machine Co.
M. Beatty & Sons
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:
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:
Mussens, Limited

Rope—Manilla and Jute:
Jones & Glassco
Northern Canada Supply Co.
Allan, Whyte & Co.

Canadian Miners' Buying Directory.—(Continued)

Rope—Wire:
Allan, Whyte & Co.
Greening, B. Wire Co.
Northern Canada Supply Co.
Mussens, Limited

Rolls—Crushing
Canadian Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
Hadfields, Limited
The Electric Steel & Metals Co.
Mussens, Limited
The Wabi Iron Works

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

Scales—(all kinds):
Canadian Fairbanks-Morse Co., Ltd.

Screens:
Greening, B. Wire Co.
Hendrick Mfg. Co.
Mine & Smelter Supply Co.
Link-Belt Co.

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

Screens—Perforated Metal:
Hendrick Mfg. Co.

Screens—Shaking:
Hendrick Mfg. Co.

Screens—Revolving:
Hendrick Mfg. Co.

Scheelite:
Everitt & Co.

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

Shaft Contractors:
Hendrick Mfg. Co.

Sheet Metal Work:
Hendrick Mfg. Co.

Sheets—Genuine Manganese Bronze:
Hendrick Mfg. Co.

Shoes and Dies:
Canadian Foundries and Forgings, Ltd.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works

Shovels—Steam:
Canadian Foundries and Forgings, Ltd.
M. Beatty & Sons
R. T. Gilman & Co.

Siline:
Coniagas Reduction Co.

Saline Refiners:
Goldsmith Bros.

Smelters:
Goldsmith Bros.

Sledges:
Canada Foundries & Forgings, Ltd.

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

Special Machinery:
John Inglis Co., Ltd.

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

Sprockets:
Ltnk-Belt Co.

Spring Coil and Clips Electrico:
Canadian Steel Foundries, Ltd.

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

Stamp Forgings:
Canada Foundries & Forgings, Ltd.

Steel Castings:
Canadian Brakeshoe Co., Ltd.
Canadian Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
Hadfields, Limited
The Wabi Iron Works

Steel Drills:
Canadian Fairbanks-Morse Co., Ltd.
Sullivan Machinery Co.
Northen Canada Supply Co.
The Electric Steel & Metals Co.
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited

Steel Drums:
Smart-Turner Machine Co.

Steel—Tool:
Canadian Fairbanks-Morse Co., Ltd.
N. S. Steel & Coal Co.
Hadfields, Limited
Swedish Steel & Importing Co., Ltd.

Structural Steel Work (Light):
Hendrick Mfg. Co.

Stone Breakers:
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
Mussens, Limited
R. T. Gilman & Co.
The Wabi Iron Works

Sulphate of Copper:
The Mond Nickel Co., Ltd.
Coniagas Reduction Co.

Sulphate of Nickel:
The Mond Nickel Co., Ltd.

Surveying Instruments:
C. L. Berger

Switches and Switch Stand:
Canadian Steel Foundries, Ltd.
Mussens, Limited.

Switches and Turntables:
John J. Gartshore

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

Tanks:
R. T. Gilman & Co.

Tanks—Acid:
Canadian Chicago Bridge & Iron Works

Tanks (Wooden):
Canadian Fairbanks-Morse Co., Ltd.
Gould, Shapley & Muir Co., Ltd.
Pacific Coast Pipe Co., Ltd.
Mine & Smelter Supply Co.
The Wabi Iron Works

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

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

Tanks—Oil Storage:
Canadian Chicago Bridge & Iron Works

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

Canadian Miners' Buying Directory.—(Continued)

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

Transits:
C. L. Berger & Sons

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

Transmission Appuiances:
Jones & Glassco

Troughs (Conveyor):
Hendrick Manufacturing Co.

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

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

TTrucks:
Canadian Fairbanks-Morse Co., Ltd.

Tubs:
Hadfields, Limited

Tube Mills:
The Electric Steel & Metals Co.
Fraser & Chalmers of Canada, Ltd.
Hardinge Conical Mill Co.

Tube Mill Balls:
Canada Foundries & Forgings, Ltd.
Fraser & Chalmers of Canada, Ltd.

Tube Mill Liners:
Burnett & Crampton
Fraser & Chalmers of Canada, Ltd.

Turbines—Water Wheel:
MacGovern & Co.

Turbines—Steam:
Fraser & Chalmers of Canada, Ltd.
MacGovern & Co.

Twincones:
Canada Foundries & Forgings, Ltd.

Uranium:
Everitt & Co.

Welding—Rod and Flux:
Prest-O-Lite Co. of Canada, Ltd.
Imperial Brass Mfg. Co.

Welding and Cutting—Oxy-Acetylene:
Prest-O-Lite Co. of Canada, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Imperial Brass Mfg. Co.

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

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

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

Wire Rope:
R. T. Gilman & Co.

Wire Cloth:
Northern Canada Supply Co.
Greening, B. Wire Co.

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

Wolfram Ore:
Everitt & Co.

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

Zirconium:
Everitt & Co.

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

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

ALPHABETICAL INDEX TO ADVERTISERS

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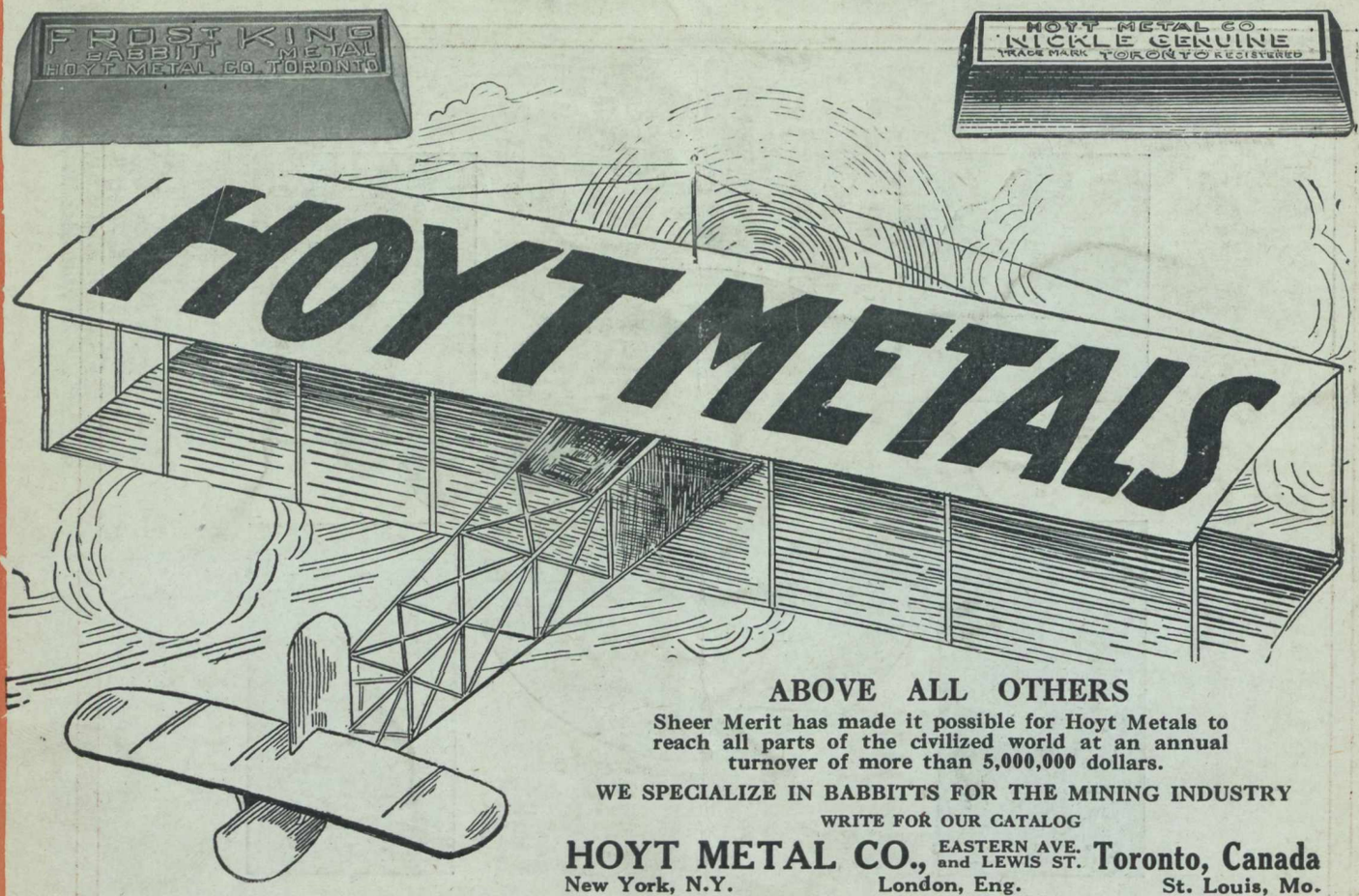

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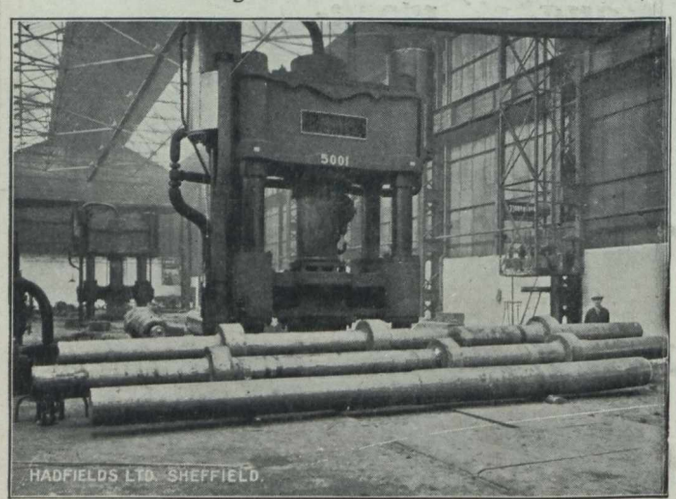

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