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CIRCULATION.

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CONTENTS.

THE NEW EDITOR

With this issue the resignation of Mr. J. C. Murray, who for more than six years has occupied the editorial chair of the Canadian Mining Journal, takes effect. Mr. Murray's successor is Mr. Reginald E. Hore.

Mr. Hore is a native of Hamilton, Ontario. Entering the University of Toronto in 1901 with a scholarship granted for general proficiency, Mr. Hore graduated in 1905. During the ensuing year he acted as class assistant in mineralogy and petrography. During 1906-1907 he was attached to the staff of the Ontario Bureau of Mines. He then became instructor in Petrography at the University of Michigan. The summers of 1907 and 1909 were occupied in directing prospecting parties in Cobalt and Temagami districts. During the winter of 1908-09 Mr. Hore acted as lecturer in Geology at the School of Mining, Kingston, since which time he has performed the duties of instructor in Geology and Petrography at the Michigan College of Mines, Houghton.

As Assistant State Geologist of Michigan, which appointment he received in 1910, Mr. Hore has had much valuable experience in Michigan mines. A close study of the Michigan copper industry resulted in a report from Mr. Hore's pen on the mining methods there in vogue. He is also familiar with Michigan iron mining districts.

In the course of his work Mr. Hore has examined many gold and silver prospects and mines in Northern Ontario. Mr. Hore is a member of the Canadian Mining Institute, of the American Institute of Mining Engineers, and of the Lake Superior Mining Institute. He has been a frequent contributor on technical subjects to the leading mining periodicals and to the published transactions of the societies to which he belongs.

Briefly, Mr. Hore is well equipped to guide the destinies of the Canadian Mining Journal. We bespeak for him the fullest support and co-operation from our readers.

J. C. MURRAY.

THE MODERN BY-PRODUCT COKE OVEN

Mr. Carl A. Meissner, chairman of the Coke Committee of the United States Steel Corporation, has recently compiled a pamphlet treating fully of the modern development of the by-product coke oven. As this subject is of extreme importance to Canada it justifies somewhat extended editorial notice.

The total production of coal, in net of 2,000 pounds, is about one billion, three hundred million tons. Of this quantity more than one hundred and fifty million tons are used for coking purposes. Germany with a total production of about two hundred and sixty million tons, uses 38,580,500 tons for coking. All of this coking is done in retort ovens. Eighty per cent. of these German ovens are of the by-product recovery type, the remainder being of the non-recovery type. Two decades ago Germany saw the last of the wasteful beehive oven.

The United States outputs over four hundred million tons of bituminous coal. In the year 1911, 53,278,248 tons were used in manufacturing coke; and from this tonnage 35,551,489 tons of coke were produced.

But in startling contrast to German practice the almost twenty-eight millions of tons were made in beehive ovens, less than eight millions being attributed to by-product ovens.

In other words, only 22 per cent. of the total coke production of the United States was from retort ovens. This fact implies a phenomenal waste of energy.

As a matter of comparison the latest correct figures for Canada give the total output of coke (for the year 1911) at 954,388 tons. In the same year 751,389 tons were imported, and only 9,852 tons exported. The total number of ovens in active operation at the end of 1911 was 1,650. At that time 1,104 were idle, and 101 in course of construction.

In Nova Scotia the Dominion Steel Corporation operates 620 Hoffman by-product ovens. The N. S. Steel & Coal Company has 30 ovens of the Bauer type, and 120 Bernard ovens. In Ontario, the Atikokan Iron Co. has 100 beehive ovens, and the Algoma Steel Company 110 Koppers by-product regenerative ovens. The Western Canadian Collieries at Lille, Alta., operate 50 ovens of the Belgian type; while the International Coal & Coke Company at Coleman has 216 beehives.

In British Columbia there are 1,420 beehives in the Crows Nest district, and 150 on Vancouver Island. There are also 101 Mitchell rectangular ovens in course of erection at the Leitch Collieries, Passburg, Alberta. Hence it will be seen that numerically the beehive oven still outnumbers to a very large degree the modern oven in Canada.

The United States Steel Corporation in the year 1912 used 24,401,577 tons of coal to produce 16,719,387 tons of coke. Of this quantity 5,164,547 tons (or about 31 per cent.) were made in by-product ovens.

We shall glance later at the market for sulphate of ammonia, that is supplied by by-product ovens. Meanwhile we may summarize briefly Mr. Meissner's comparison of the by-product oven with the beehive oven.

Among the advantages possessed by the former are these:

The by-product oven can profitably form a definite integer of the modern blast furnace plant. Coal can be shipped for a greater distance than to the beehive. The range of coals available for coke making is much wider. The valuable by-products and the recovered gas are direct compensating factors. The actual cost of manufacture is less. These considerations amply repay the larger primary investment. In Mr. Meissner's own words:

"The by-product coke oven is changing the economic geography of the available coal fields for coking purposes in the United States."

As the converse is true of the beehive oven, the case for it need not be stated. One very interesting and specific comparison has to do with a comparison of the two types in coking Pocahontas coal. It would take, for instance, 6,154 beehives, 72 hours to produce 2,880,000 tons of coke per year from 4,800,000 tons of Pocahontas coal. 560 standard by-product coke ovens pushed once in 17½ hours would require only 3,502,000 tons of coal to produce a similar amount of coke. No further proof of the wastefulness of the beehive is necessary.

As to the formerly much disputed point, the comparative qualities of the two cokes, modern observation is entirely in favour of the conclusion that the by-product oven when properly handled, will produce coke structurally as good as will the beehive. The advantages in handling and quenching are entirely with the by-product oven.

MR. A. A. COLE'S REPORT

The annual report of Mr. A. A. Cole, mining engineer for the T. & N. O. Railway Commission, has been published and distributed. The mining fraternity has learned to expect a very interesting report from Mr. Cole and will find much of value in this one. The production of gold at Porcupine and of silver at Cobalt receives particular attention. The methods of mining and treating the ore at Porcupine are described, and revised flow sheets of the several Cobalt concentrating mills are given. The illustrations include some remarkably fine underground photographs of gold and silver ore bodies. Such records of the character of ore deposits are unfortunately very rare.

Elsewhere in this issue will be found some extracts from Mr. Cole's report.

A QUICKSILVER FLOTATION

During the past few months the firm of J. A. Morden & Co., Toronto, has been advertising for sale shares of stock in a quicksilver property in California. The wording of one advertisement indicates that the property is merely an unproved prospect, but in another it is stated that there is a large tonnage blocked out. In one Toronto daily paper it is stated that "they have now blocked out 104,167 tons of ore," while in another issue of the same paper we find that the engineer's report reads "By cross-cutting and surface-trenching ore body, containing approximately 104,167 tons, lies practically exposed as near as can be determined at the present time."

In another Toronto daily the engineer is quoted as saying, "We have an immense body of ore worth many millions." This the public is invited to buy at 70 cents per share, the company being capitalized at $1,000,000 divided into 1,000,000 shares. Buyers attracted by this astonishing liberality of the promoters will receive a shock when they read some of the other advertisements, however. In a pamphlet recently issued there is this paragraph.

"As already stated, no sinking or proving of this valuable mine has been done, for so rich is the ore that this has been deemed unnecessary, but on the surface of the property it has been very conservatively estimated that there is over $20,000 worth of ore in sight, and the entire property has so far proven to carry ore running from 3 to 15 per cent. quicksilver."

The promoters go further and attach a report signed A. A. Lewis, M.E., in which it is stated that "there is an immense body of ore to start with and I believe that at depth the value will increase. This, however, has been proven to a certain extent by the tunnel which taps the ore body at a depth of one hundred feet, the value being considerably higher there than at the surface."

The same gentleman is responsible for the statement that "the general trend of the formation is east and west, with the vein dipping approximately forty per cent. to the north."

The company is incorporated as the King's Quicksilver Mining Company, Ontario, and you are invited to make all cheques payable to J. A. Morden & Co., Toronto.

MICROSCOPY IN ECONOMIC GEOLOGY

An address by Prof. R. Beck, delivered on the occasion of his inauguration as rector of the Royal School of Mines at Freiberg, Saxony, Oct. 3, 1911, has been translated by Joseph T. Singewald, Jr., and published in the May 31, 1913, issue of our contemporary, the Engineering and Mining Journal, N. Y. His subject is the use of the microscope in the study of rocks and ores, and he claims that such mining and geological engineers as wish to train themselves for consulting work, or such as wish to participate as pioneers in the mining development of new regions, and above all such as are striving to take an active part in the scientific part of practical geology, must familiarize themselves with the fundamental methods of microscopy. While the early protographers neglected opaque minerals and confined their studies as far as possible to fresh rather than altered rocks, their methods are now being successfully used in the study of all classes of ore deposits. Dr. Beck points out how microscopic study has given information concerning the origin of many ores, such as the platinum of the Urals, the nickel ores of Sudbury, contact metamorphic deposits of many districts and replacement processes or metasomatism. Millmen might well make more use of the methods in solving ore dressing problems, as the microscope frequently gives valuable information concerning the physical properties of the ore. The mine examiner will sometimes find the instrument useful in detecting salting, and in making critical comparison of specimens. The application of microscopic methods to the study of opaque minerals is as yet a but slightly explored field. A few years ago Dr. Wm. Campbell and C. W. Knight showed how the methods could be applied to the study of such ores as those of Sudbury and Cobalt districts, and at a recent meeting of the American Institute of Mining Engineers, L. C. Graton and Jos. Murdoch presented valuable results of the microscopic study of sulphide ores of copper.

For purposes of reproduction and certain studies special preparation of sections is necessary; but ordinary thin sections can also be very profitably studied with a simple microscope.

RECORDING MINE ACCIDENTS

Recent publications of the U. S. Bureau of Mines show that, contrary to general opinion, the percentage of accidents in metal is greater than in coal mines. Some astonishing differences are shown between the several metal mining districts in number of non-fatal accidents reported. This, however, is largely, if not wholly, due to the various systems of recording accidents. Some companies make a record of practically every accident, however slight, while others record only the more serious accidents. Comparison is therefore, unfair to those who keep the most careful records and these are frequently the companies which take best care of their men.

MAGNETIC IRON SANDS

For various reasons the magnetic sand deposits in the County of Saguenay, Quebec, has been the subject of much investigation and discussion. In these columns have appeared from time to time articles from the pens of official and independent investigators.

Mr. G. C. Mackenzie, of the Mines Branch, Ottawa, is the last writer to deal with the matter. He is the author of a substantial pamphlet recently issued by the Branch.

The sands consist essentially of free particles of ilmenite, magnetite, garnet, quartz, feldspar, and olivine. The iron content ranges from about 15 per cent. to more than 50 per cent., with percentages of titanium running up to more than 7 per cent.

A great many tests have been made. Some of these have been crude, and some have been elaborate. Mr. Mackenzie reports recoveries of from 44 to 50 per cent. of the total iron content. By progressive concentration the iron content of concentrates was brought up to over 70 per cent., while the titanium content of this concentrate was less than 2 per cent.

The concentration ratio in one series of tests was practically thirteen units of crude material to one of concentrates. Three separations and two intermediate crushings were used. This, however, does not imply that commercially all these steps would be necessary.

The estimate of the tonnage of iron content in the Natashkwan sands is 500,000 tons of magnetic iron concentrate, averaging 67%. The necessary conditions of working are that the sand be concentrated wet; that the capacity of the concentrating plant be large, since the season is short; and that the machines be of strong and simple construction. The estimated cost of a dredging plant capable of handling 5,000 cubic yards of sand per day, with auxiliary plant for retreating and briquetting, is $623,200. The total operating expenses for one year turning out 100,000 tons of briquet yearly, are placed at $270,000. In other words, the cost of briquettes at Natashkwan harbour would be about $2.70 per ton, the freight to Philadelphia about $1.50, and the selling price at the latter point, $5.02. Considering all the various factors this gives a paper profit of 83 cents per ton.

In a construction sense, Mr. Mackenzie's report is encouraging. It would seem, however, that much more time will have to be spent in checking up details of tonnage, extraction, and markets.

GAYLEY DRY BLASTS

Professor Josef Von Ehrenwerth has contributed to the proceedings of the Iron and Steel Institute (Great Britain) a very clear statement of experience with the Gayley dry blast at Etna blast furnaces.

It will be remembered that when the first figures concerning the Gayley dry blast were published they were met with incredulity. It could not be understood how such a marked saving in fuel could be effected by eliminating most of the water from the air that was supplied to the furnace. The equation appeared to be lopsided, as there was no proportion between the actual amount of fuel necessary to disassociate the water contained in the atmosphere as compared with the saving recorded.

Prof. Von Ehrenwerth's statements give a very clear view of the facts.

He states that the economic advantage of drying the blast is greater the lower the temperature of the blast, and the higher the temperature of the waste gases at which the furnace previously worked. The losses due to conduction and radiation, are, naturally reduced in proportion as the temperature of the waste gas is lowered. Hence, with the same periods between tapping, the blowing engines and stoves can handle a larger production without actually increasing their duty. The melting process is accelerated, the silicon percentage is increased, and the sulphur content lessened.

The supreme advantage of uniform working is also secured. Loss by flue dust is reduced, and in general the fuel consumption is lessened from one and all of these causes. The adoption of dry blast is certain to prove advantageous, says Prof. Von Ehrenwerth, for blast furnaces working with high blast temperature and yet with high gas temperature, and for furnaces in localities where the atmosphere is particularly moist. It is particularly applicable to furnaces where Bessemer pig, foundry pig, and high silicon pig are produced.

EDITORIAL NOTES

Apparently authentic reports from White Horse state that new placer deposits have been discovered on a creek that has just been christened Meander Creek. Spectacular panning results have been obtained. A modest rush is under way now, and soon the merits of the region will have been determined.

The annual report of the Dominion Steel Corporation is encouraging. After payment of common and preferred dividends the balance carried forward for this year amounts to the respectable total of $883,012.

Mr. Harley B. Curtis, of New York, has succeeded Albert Freeman as president of the McIntyre Porcupine Mines, Limited.

A second dividend payment of 10 per cent. has been declared by the Seneca-Superior Mining Company. It will be remembered that the Seneca-Superior Company operates what was formerly known as the Kerry property on Cart Lake, under lease from the Peterson Lake Mining Company. The latter company receives a 25 per cent. royalty from the former.

The average extraction at the Hollinger mill up to June 1st of this year is 95.8 per cent. The average value per ton or ore mined is reported at $21.89.

A new record for iron ore shipments from the Lake Superior district was made last month. The shipments were 7,284,212 tons, compared with 5,919,074 tons in May, 1912, and 3,684,819 tons in May, 1911.

PORCUPINE GOLD MINES CO.

In the circular announcing the offering, the president of the Porcupine Gold Mines states that a syndicate, composed for the most part of directors, bought 250,000 shares of treasury stock at 50 cents in October, 1911 Later on further amounts running in excess of $62,000 were advanced the company by certain shareholders. Other indebtedness amounts to somewhat more than $18,000. The unavoidable delay in completing the mill depleted the treasury, and after the commencement of operations it was found necessary to install a cyanide plant. This will not cost more than $30,000 and the extraction then should be 95 per cent. At the time of the strike in November, 1912, the property was shut down and it has not been re-opened as yet.

CORRESPONDENCE

A NOTE ON THE COMPARATIVE EFFICIENCIES OF COMPRESSED AIR VERSUS HYDRAULIC POWER FOR MINING OPERATIONS

Comments Upon Mr. G. A. Denny's Paper Read Before the Mexican Society of Mining and Metallurgy.

The discussion of this subject resolves itself almost naturally under two heads. (1) The efficient application of the power. (2) The profitable transmission of the power. At the outset the vision of hydraulics as a motive agent for rock drills in mining operations is startling, and one is compelled to pause and consider how it is to be accomplished. On closer inspection the scheme fairly bristles with difficulties, not to say impossibilities. The utilization of water power in mountainous regions is a common enough event, but the energy thus obtained is employed for turning water wheels, turbines, working water engines, for hoisting, hauling, elevating, and the like—not for hydraulic drills, surely. Supposing, howeved, that such drills are things of fact, and that they are capable of active employment, it is an interesting problem to solve what efficiency they will possess or indeed what use they will be at all at a point of consumption above the source of water supply. Is the water to be pumped up—by hydraulic power? Besides this difficulty comes that of air traps and the like, all of which makes the arrangement a very inefficient and vexatious one. Since specific mention is made of hydraulic drills it would be interesting to know how these are to be worked. What is to become of the water ejected from the exhaust? How is the drilling action effected by the hydraulic agent and to what extent does the incompressibility of water influence the operation. A clear explanation and elucidation of these difficulties would be welcome. If the water is to be simply transmitted to effect a compression at a situation in closer proximity to the point of application, the only gain is a deferred transformation at an increased initial cost for piping. It appears obvious, too, that this scheme would be productive of a diminished overall efficiency. It seems, then, that from the standpoint of application alone, we are forced to turn for our energy to compressed air. Its use is not restricted to points beneath the highest level of the water. Above or below this elevation the power is transmitted with equal ease. The diminished pressure at higher elevations does not materially effect the potential energy of air compressed at lower levels, say—at the base of the head of water.

In the matter of transmission over long distances a comparison of the two systems is decidedly unfavourable to hydraulic transmission. Let us consider the case of water under 1,000 lbs. initial gauge pressure transmitted over a distance of 10 miles and compare the efficiency obtained at the distant termina lwith that of air under an initial gauge pressure of 110 lbs. with an initial 5,000 horse power. We will equalize conditions by employing in each instance a main pipe of 20 inches diameter. Water flowing through a pipe at 1,000 lbs. pressure and with a velocity of 6 feet per second will pass 802 c. ft. per minute. These figures will give an initial horse power of

$$144 \times 802 \times 1{,}000 \div 3{,}300 = 3{,}500 \text{ h.p.}$$

Under these conditions, however, there will be a friction loss of 31 head feet per mile, or 310 feet in 10 miles. This is equivalent to a loss in the final pressure of $310 \div 2.3 = 135$ lbs: the final pressure=865 lbs.: hence the final horse power=

$$144 \times 802 \times 865 \div 33{,}000 = 3{,}027 \text{ h.p.} = 14\% \text{ loss..}$$

In the case of the air at 110 lbs. initial gauge pressure, 36,000 c. ft. of free air is the quantity entering per minute. An average leakage of 800 c. ft. per minute (direct observation in an actual test) occurred.

$$\text{Loss due to leakage then} = \frac{800 \times 100}{36{,}000} = 2.2\%.$$

The air entered the main under 110 lbs. pressure, and was received at the terminal 10 miles distant under a pressure of 100 lbs. That is to say, though the total drop in pressure was as much as 10 lbs. per square inch the actual power loss was only 3.9 per cent. Hence the total energy loss in this long transmission does not exceed 6 per cent. These results demonstrate the inferiority of the hydraulic system of transmission, but in practice the comparison of percentage losses or gains is not the sole consideration. A greater percentage loss may be disregarded if the total effective horse power is greater. The hydraulic system cannot, however, claim this. The hydraulic pressure of 1,000 lbs. per square inch delivers an effective 3,030 h.p. through a 20-inch main at the distant terminal at a conservative loss of 14 per cent. The compressed air system passing air through the same size main and under 110 lbs. pressure delivers at the distant terminal an effective 4,800 h.p. with a maximum loss of 6 per cent. Which is the more efficient and the more preferable scheme? There is another important point of consideration. What of the dangers of the water transmission with its rams and shocks and general eccentric behaviour in pipes? We said our two mains are to be of the same diameter. Are they of the same thickness? Is there no safety factor to claim consideration? Are there no additional precautions to be exercised in the shape of special valves to avert disaster imminent upon increasing pressure? Will it not be necessary to encase the water pipes in the ground to prevent freezing in winter? Will all this cost less or no more than pneumatic installation? Low temperatures do not effect air transmission to any appreciable degree. Consequently it is not necessary to lay the pipes in the ground. An air main 5/16-inch thick will necessitate a thickness of 2-inch. in the corresponding water main, allowing for a marginal factor of safety of 6. This increased thickness in the pipe will call for an expenditure six to eight times that required for an air installation. I hardly think that there is need of further comparison. The time will be better spent in attempting to assure doubters living in a country of water powers and potential hydraulic transmission projects that there is no need to seek a solution to the complex and numerous problems of air compression and transmission in the employment of hydraulic drills. The water power so ready at hand may be used to compress air directly and without machinery of any sort. The system, whilst of a decidedly novel character, is distinguished by its simplicity of construction and easy operation. Mr. C. H. Taylor, of Toronto, is its designer and the apparatus is applicable for either high or low falls of water. It has received much attention from the leading mining journals of late years, and it is unnecessary to go into the details of its construction and operation in this short paper. Broadly speaking, the plan adopted is to compress air in an inverted syphon, using the water itself as the compressing agent. A shaft is sung to the requisite depth to accommodate the compressor pipe. Water enters the pipe by way of numerous small pipes placed at the top of the compressor pipe and descends into a large air chamber at the bottom. The water escapes into the tail race by the uptake shaft. As the water enters the small intake pipes it draws air in with it. The air is carried in the form of bubbles down the shaft by the water. During this downward course the air suffers a continual and increasing compression, the ultimate degree of which depends upon the vertical height of the water in the uptake shaft. When the water reaches the bottom the air escapes into the air chamber from which it displaces the water. Such is the principle of this mode of air compression. Not to enter at great length into a just estimate of this excellent invention, there are four points well worthy of consideration.

1. The air is isothermally compressed. The air is compressed, not in bulk, but in small bubbles. What minute quantity of heat may be generated in the actual compression is immediately absorbed by the water without appreciably effecting the temperature of the latter. Hence from a practical standpoint the compression proceeds isothermally and the air is delivered to the point of consumption at the temperature of the water.

2. The pressure increasing and the temperature remaining constant causes a portion of the moisture in the entrapped air to condense on the walls of the bubbles whence the water absorbs it. Hence the air delivered to the rock drills, say at 110 lbs. pressure, is six times dryer than atmospheric air. It is unnecessary to dilate upon the importance of this property in actual working conditions.

3. The pressure of the air is practically constant. It depends upon the vertical height of water in the uptake shaft. At the Cobalt plant where air is used night and day the latest pressure charts indicate a steady graph of 110 lbs. per square inch through the 24 hours.

4. The production of compressed air is continuous.

If we admit that in the selection of an air compressor the following considerations are of importance:

1. An economical prime motor.

2. A compressor, which, while having a high degree of efficiency, has also means for reducing the heat of compression to a minimum, then it must be conceded that a method of compression such as briefly described above is exceedingly worthy of more than passing notice. The efficiency of the system is at once patent from the following table which is a copy of the official test of the 5,000 h.p. compressor installed at the Victoria Copper Mines, Michigan. The test was made by Profs. F. W. Sperr and O. P. Hood, of the Michigan College of Mines.

Air Measurements.

Sq. Feet	Vol. per sec.	Cub. ft. per min.	Absolute Pressure Free	Compres'd	H.P.
4	44.09	10,580	14	128	1,430
4	49.74	11,930	14	128	1,623
4	38.50	9,238	14	128	1,248

Water Measurements.

Flume Area	Vol. per sec.	Head in ft.	Cub. ft. per min.	H.P.	Efficiency
71.75	3.033	70.5	13,057	1,741	82.17%
67.03	3.684	70	14,820	1,961	82.27%
72.16	2.936	70	12,710	1,700	73.50%

The h.p. of the air in the first table from which the efficiency is calculated, is the energy delivered immediately at the point of application. In general, it may be stated that the overall efficiency of the hydraulic system of compressing air may be estimated conservatively at 78 per cent. If I may quote from Mr. Denny once more, I will join with him in saying, ''In view of the great advantages offered by hydraulic (compressed air) transmission and hydraulic (compressed air) drills, it is greatly to the interest of the mining community to make most careful enquiry into the possibility of using it.'' The words in parenthesis are mine and I trust that Mr. Denny will accept my sincere apologies for so interpolating his remark.

STEPHEN HOUSE.

811 Bathurst St., Toronto.

A PROTEST

To the Editor of the Canadian Mining Journal:

Sir,—On my return after some weeks' absence your editorial regarding the inquiry upon the Eight Hour Law has come to my notice.

I must take the strongest exception to the insinuations you make against the good faith of the Government, and especially of Hon. Mr. Hearst, Minister of Lands, Forests and Mines, in connection with the matter. No member of the Government in any way requested or suggested that I should make other than an impartial and bona fide investigation and report to the best of my ability. Mr. Hearst, from whom I received my instructions and upon whom, from his position and the circumstances of the case, the chief onus (apart from myself) would naturally rest, did not even intimate to me any opinion in favour of the proposed law. Except that he desired the inquiry to be thorough, I was given an absolutely free hand both as to the manner and the result of the inquiry, and any suggestion that my discretion or judgment was in any way hampered or interfered with by him or by the Government is altogether contrary to the fact. How far I have carried out the duty entrusted to me I will have to leave to the judgment of those who are aware of the course of the inquiry, or who will take the trouble to give the report itself a little more careful and thoughtful perusal than you appear to have done, and, I might add, to those who are familiar with the manner of performance of my other duties during the six or seven years I was engaged almost exclusively with mining matters.

It may not be material but I may mention also that I have not since about three months prior to the making of my report (except in regard to that matter) held any office under or been in any way in the service or pay of the Ontario Government.

Yours, etc.,

S. PRICE.

St. Thomas, Ont., May 29, 1913.

CASEY COBALT.

Returns for seven weeks from 22nd March to 3rd May: ''Production of high grade ore, 22¼ tons; production of concentrates, 35 tons; total, 57¼ tons. Total estimated value, £15,271. Total estimated expenses, £3,106. Profit at mine, £12,165. Drifting, 163 ft.; crosscutting, 72 ft.; sinking, 88 ft.; raises, 61 ft.; total footage, 384 ft.''

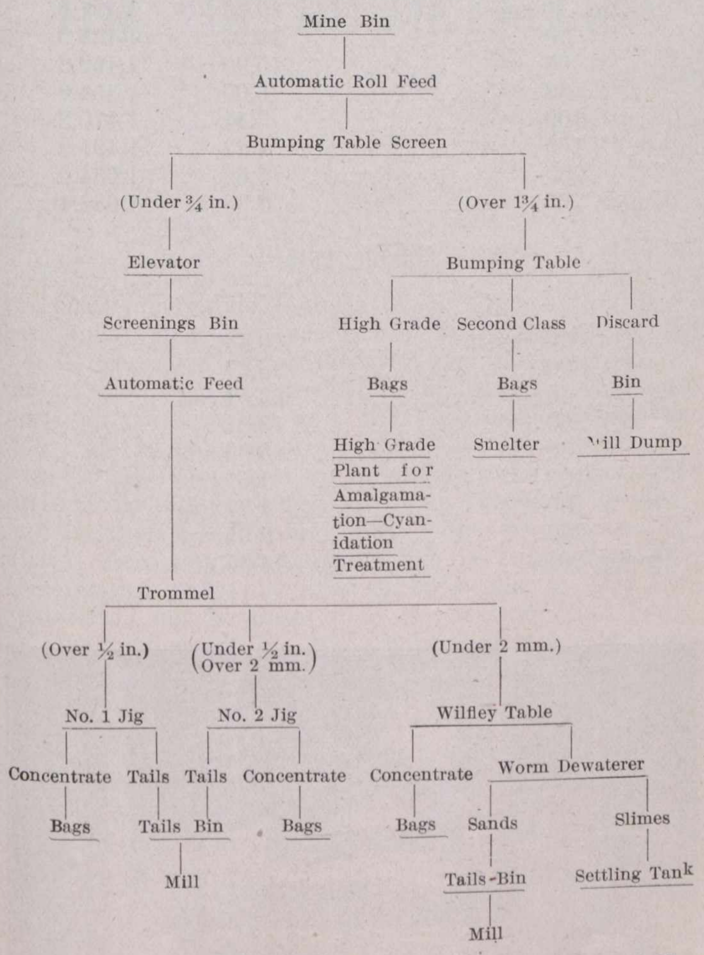
NIPISSING PICKING AND JIGGING PLANT, COBALT, ONT.

By Reginald E. Hore,

Until the recent construction of a low grade mill the ore hoisted from workings on several veins on the Nipissing proper was trammed to a sorting plant and there classified into high grade, second-class and milling ore. The following description applies to the plant as it was operated in 1912. The sorting is now done in a similar way at the mill.

The ore trammed from the shaft is emptied into a bin from which it is drawn off by a Nipissing automatic roll feeder. From the roller the ore drops on a bumping table, operated by a Parks pusher, where it is washed by a water sprinkler. A screen with 1¾ in. round holes separates the finer ore, and only the oversize of 1¾ in. passes on to the picking table. Here two men pick out high grade and second-class ore and put it into bags. The discard is milling ore which drops from the end of the table into a small bin and is drawn off from a chute into a car and trammed to the mill dump or stock pile. The two men sort on the table about four tons of ore per hour. There is about four tons per hour of undersize which is sorted by two jigs and a Wilfley table. The accompanying flow sheet indicates the process of treatment.

FLOW SHEET OF NIPISSING PICKING AND JIGGING PLANT



The undersize from the 1¾ in. round holes of the bumping table runs down to a pocket from which it is carried up by a bucket elevator to a sizing trommel. The trommel, having two sections with ½ in. and 2 mm round holes, classifies the ore into three sizes; (a) under 1¾ and over ½ in., (b) under ½ in. and over 2 mm, (c) under 2 mm. The large sizes go to No. 1 jig, (b) goes to No. 2 jig, and (c) goes to a Wilfley table. The tails from the table lifted by a worm dewaterer unite the jig tails and pass to a bin from which they are drawn off by a chute into a car and trammed to the mill dump. The overflow from the worm dewaterer runs to settling tanks. The settled slime is drawn off at intervals and sent to the mill dump, where it mixes with the coarser tails. The clear water overflow from settling tanks unites with water from jig tail dewatering screens and is pumped back to tanks for re-use.

The jigs are of a special type, designed by Mr. H. A. Kee, and known as the Nipissing Plunger Jig. Mr. Kee describes this as a Harz type with some improvements, which make it possible to run with less power and water and make cleaner concentrates with less attention from the jig men. All water is taken from below the plunger.

The plunger edges are cut with a bevel of ¾ in. in 4 in. and covered with a strip of 8-in. 4-ply belting, which projects below the bottom of the plunger. This makes a practically water-tight joint between the walls of the plunger pit and the plunger itself on the downstroke, and consequently increases the efficiency of each pulsation on the downstroke. The air valves, which were closed on the downstroke, open on the upstroke, thus eliminating plunger friction and sand suction through the jig screen. The screen is therefore never blocked or dirty. To allow for washing and cleaning of the lower part of the jig, 4-in. hand holes are provided.

Results Obtained in Operation of Plant.

During the first six months of 1912 this plant produced, according to Mr. Kee, classified products containing 1,650,000 ounces silver. The cost for treatment was 0.2 cents per oz. silver. The average tonnage run through the plant was eight tons per hour, the highest tonnage being nine tons per hour. The average tonnage run over the jigs and Wilfley table, which run only during the day shift, was five tons per hour, the highest tonnage being seven tons per hour. The plant has a capacity therefore of about 200 tons per day.

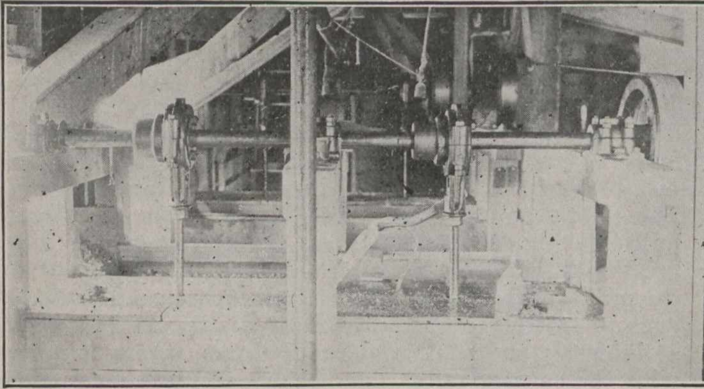
Of the silver:—

- 73 p.c. was in high grade hand picked ore.
- 5 p.c. was in second grade hand picked ore.
- 15.6 p.c. was in concentrates from No. 1 jig.
- 3.5 p.c. was in concentrates from No. 2 jig.
- 2.8 p.c. was in concentrates from Wilfley table.

The milling ore made up of picking table discard and jig and table tails averaged 29.4 ounces.

The high grade ore and all concentrates are treated at the Nipissing high grade mill, and the silver is shipped as bullion. From the figures just quoted it will be seen that 95 per cent. of the silver product of this plant leaves Cobalt in the form of bullion. The remaining 5 per cent. in the form of second grade hand picked ore at present is shipped to smelter.

The total recovery obtained without treating the milling ore, which is being piled for future treatment, is 78.5 per cent. of the silver in run of mine ore. This silver was contained in 6.5 per cent. of the total weight of ore. The 21.5 per cent. is in 93.5 per cent. of the ore which is now on the mill dump.



No. 2 Jig

Bumping Table, Nipissing Jigging Plant

Character of the Products Obtained.

The average silver contents of the ore and concentrates obtained during the first six months of 1912 were as follows:—

	Ozs. per Ton.
High grade ore, hand picked........	2,200
Second-class ore, hand picked	350
No. 1 jig concentrates	1,900
No. 2 jig concentrates..............	1,700
Wilfley table concentrate	1,500
Slime tails	75
Milling ore, all tails and discards..	29.4 p.c.

These figures, as well as all others here given, are from data furnished me by Mr. Kee of the Nipissing Mine.

The amounts of the various classes of products and the silver content was as follows:—

	Silver Content. %	Weight. %
Recovery by picking high grade......	57.3	3.60
Recovery by picking second grade.....	3.9	1.50
Recovery made by No. 1 jig	12.3	0.92
Recovery made by No. 2 jig	2.8	0.26
Recovery made by Wilfley table	2.2	0.22
Discard from picking table and tailings from jigs and Wilfley table and slimes from settling tanks (all of which go to mill dump)	21.5	93.50
	100	100

The efficiency of these simple appliances is shown by the following figures from assays and screen tests:

Silver Content of Concentrates and Tails.

	Concentrate. Oz.	Tail. Oz.
No. 1 jig.	1,900	27.6
No. 2 jig.	1,700	30.0
Wilfley table	1,500	33.4

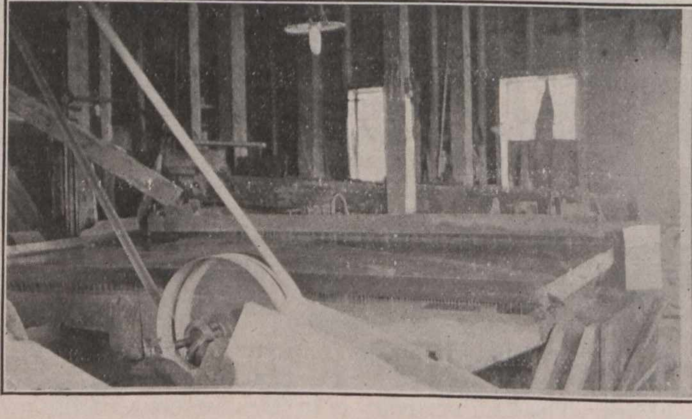
Screen Tests on Table Concentrates and Tails.

Table Concentrates (undersize of 2 mm, round hole).

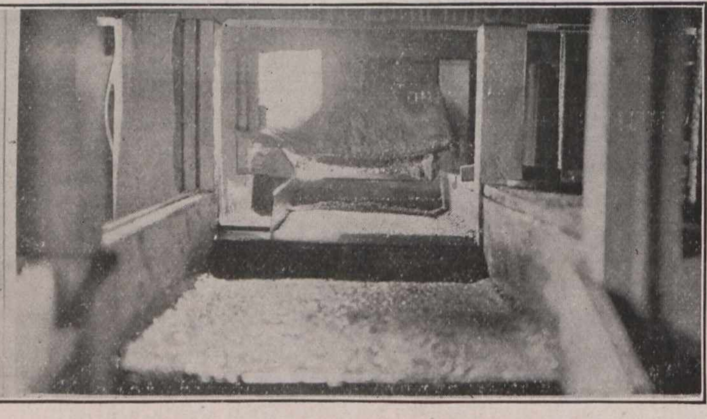
	% Weight.	Oz. Silver.
On 20 mesh.	49.23	1,191.5
" 40 "	15.25	1,438.9
" 60 "	15.90	1,462.2
" 80 "	6.00	1,354.0
" 100 "	3.41	1,470.8
" 150 "	4.22	1,495.9
" 200 "	1.62	1,634.0
Under 200	4.35	1,638.4

—Table Tails.—

	% Weight.
On 10 mesh.	0.43
" 20 "	36.27
" 40 "	23.51
" 60 "	13.21
" 80 "	3.90
" 100 "	1.69
" 150 "	4.27
" 200 "	2.35
Under 200 "	14.35



Wilfley Table.



No. 1 Jig, Nipissing Jigging Plant

—Overflow from Dewatering Worm.—

	% Weight.	Oz. Silver.
On 60 mesh.	0.78	107.8
" 80 "	3.99	22.6
" 100 "	5.0	15.5
" 150 "	12.99	16.0
" 200 "	5.69	23.9
Under 200 "	71.54	61.0

A consideration of these screen tests will show that some of the ore as it comes from the mine is in very small particles, and the advantage of concentrating this at once is evident. The other figures show that with very little classifying of feed the process gives a good recovery from the mine fines at a low cost. Of all the ore run through the plant in the first six months of 1912, 49 per cent. was sorted by hand on the bumping table, while 51 per cent. passed through the 1¾ in. holes and was concentrated by two jigs and one table. The ore is not crushed at all, but is treated just as it comes from the mine.

Some general views and details of the plant are shown by the accompanying photographs.

A very similar plant for treatment of ore at Kerr Lake mine is thus described by Mr. John Seward in one of the annual reports:

"The question of economically and effectively handling the ore from No. 7 shaft was carefully gone into this year, with the result that a bumping table and three jigs were installed, with trommels for classifying the jigging material. Also a contract was made with the Nova Scotia Silver Cobalt Mining Co., Ltd., to mill the tailings product from this plant. Formerly the No. 7 shaft ore product was worked by hand on seven sorting tables, requiring fourteen men. The bumping table replaces these sorting tables, mechanically screens out the smaller product and feeds the coarse material for hand sorting. It requires only seven men to handle a larger tonnage than heretofore. First and second grade ore is hand-sorted on the bumping table and waste rock picked off for discard, so as to keep the table tailings well up to milling grade. The undersize of a 1½-inch mesh screen at the head of the bumping table, is classified by trammels into three sizes for jigging. These sizes are 1½-in. to ¾-in., ¾-in. to ¼-in., and ¼-in. to 1/16 in. The new plant was put in operation in June. Our records of low grade milling rock produced by it, show a daily average of 46 tons of ore assaying 20 ozs. per ton. This is made up of 48 per cent. of bumping table tailings assaying 14.5 ozs. per ton, 44 per cent. of jig tailings assaying 14.7 ozs. per ton, and 8 per cent. slimes (undersize of 1/16 trommel) assaying 82.7 ozs. per ton. The slimes product will hereafter be treated on a concentrating table and the tailings added to the milling product."

THE "DE RE METALLICA" OF GEORGIUS AGRICOLA*

A REVIEW

(Continued from last issue.)

Having covered fully the practice and business of mining, Agricola in Book VII explains the art of assaying. "The method of assaying ore used by mining people," he explains, "differs from smelting only by the small amount of material used." Among the precautionary measures accentuated by Agricola is this: "It is necessary that the assayer who is testing ore or metals should be prepared and instructed in all things necessary in assaying and that he should close the doors of the room in which the assay furnace stands, lest any one coming at an inopportune moment might disturb his thoughs when intent on the work." There is more than a little philosophy behind this advice. So also is there common sense behind the suggestion that the assayer place his balances in a case so that the scales may not be agitated by draughts of air. Very full particulars of the construction of brick or clay furnaces are set forth. The requisite materials and dimensions of muffles and crucibles are specifically described. "The muffle is made of clay, in the shape of an inverted gutter tile, it covers the scorofiers lest coal dust fall into them and interfere with the assay." The crucibles then used were made either of clay or ashes and were essentially similar to those in use to-day. The cupels, however, were made of leached and sifted ashes. Agricola mentions particularly that the ashes obtained from burned bones, "especially from bones of the heads of animals" were best adapted to the making of cupels. Instructions now follow for the fluxing of different kinds of ores. One can judge the tenor of these instructions from the following excerpt. "Great power is discovered in all these fluxes, but we do not see the same effect produced in every case, and some are of a very complicated nature. For when they have been mixed with the ore and are melted in either the assay or the smelting furnace, some of them, because they melt easily to some extent melt the ore......to the first order belongs lead, whether it be reduced to little granules or resolved into ash by fire."

With much care Agricola describes the methods of preparing the various oxidizing and reducing agents. It must be remembered that in those days the chemist was forced to manufacture his own supplies. Hence the laboratory was to a certain extent a factory.

A quaint illustration in Book VII. shows a sturdy German wight gazing intently into an assay furnace through a slit in a face board. Other illustrations show a variety of forms of muffles, cupels, scorofiers, etc. Not only are the standard methods of assaying outlined in Book VII., but the touchstone is dwelt upon at length. Naturally the assayer of Agricola's day was not accurate in the sense that the modern assayer is. But it is quite refreshing to note the essential similarity of practice as between that day and this.

In Book VIII. Agricola plunges into the methods of smelting. "Since nature," says he, "usually creates metals in an impure state mixed with earth, stones, and solidified juices, it is necessary to separate most of the impurities from the ores as far as can be before they are smelted, and therefore I will now describe the methods by which the ores are sorted, broken with hammers, burnt, crushed with stamps, ground to powder, sifted, washed, roasted, and calcined." The work of sorting the ore devolved upon boys and women.

In Book VIII. Agricola plunges directly into the problems of ore-dressing and metallurgy. "Questions of assaying were explained in the last book, and I have now come to the greater task, that is, to the description of how we extract the metal." The author then proceeds in logical sequence to describe the methods then in vogue of ore concentration. Ores of valuable metals are in nature mixed with "earth, stones, and solidified juices." It is therefore necessary to separate the ores from their impurities. Agricola dwells largely upon hand-sorting and stamping, grinding, washing and roasting. The illustrations in Book VIII. are singularly naive. It is worth noting that the ladies wear the adaptable harem skirt that is in vogue to-day. Especial pains are to be taken, as Agricola notes, to separate the metallic from the crude ore. Metallic masses, it is recommended, should be flattened out and placed either on the stump of a tree and cut into pieces with an iron chisel or else "with an iron tool similar to a pair of shears." It is explained that "ore is burned for two reasons, either that from being hard it may become soft and more easily broken and more readily crushed with a hammer or stamps, and then can be smelted, or that the fatty things, that is to say, sulphur, bitumen, orpiment or realgar may be consumed. Sulphur is frequently found in metallic ores, and generally speaking, is more harmful to the metals, except gold, than are the other things. It is most harmful of all to iron, and less to tin than to bismuth, lead, silver, or copper. Instructions, that would practically fit the case even to-day follow for the roasting of pyritous and lead ores. In a practical though rather vague way Agricola meets the difficulties of roasting complex ores. One must of necessity read Book VIII. to realize how little was known at that time of the chemistry of to-day and how ingenious were the devices and subterfuges by which the various ore-dressing metallurgical complications were met. The stamp mill was even then an established factor. Screens were not in use. Instead of cams the shaft was grooved and engaged a tooth projecting from the stamp stem. The whole structure of the stamp mill was of wood, shod with iron, and over-shot water wheels were apparently the most common sources of power. As labour was excessively cheap the hand sorting and hand jigging of ore constituted a very important part of milling practice. But even at that date the use of canvas tables was well known. In fact from the illustrations alone one can see all the evidences that go to make up the modern concentrating mill.

Book IX. deals with the various methods of calcining and smelting ores. Agricola in opening this chapter points out that while one may by stamping take away much of the valuable material from all ore yet much valuable material may yet be concealed in the ore. "Wherefore smelting is necessary, for by test means earths, solidified juices, and stones are separated from the metals so that they obtain their proper colour and become pure and may be of great use to mankind in many ways."

The conception of smelting in these medieval days was entirely confined to the idea of acid and basic elements, not to the recovery of metals. One other quotation will serve very well to show the point of view that the metallurgists had in the day of Agricola.

"Since metalliferous ores differ greatly among themselves, first as to the metals which they contain, then as to the quantity of the metal which is in them, and then that some of them are rapidly melted by fire, and others slowly, there are therefore many methods of smelting. Constant practice has taught the smelters by which of these methods they can obtain the most metal from any one ore."

It is pointed out also in the elaboration of this idea that ores of easily melted metals are more easily obtainable than ores of refractory metals. And the author goes on to explain that refractory ores require more attention from the metallurgist. It is quite impossible to notice all the complications of metallurgy that are carried on from this point. Suffice to say that each metal is dealt with in its place. Not only are the functions of the weathering of ore considered (as with copper), but every consideration that saves labour is given its due place

The metallurgy of lead had been well mastered at this point, from the mere fact that the melting temperature of lead is low on the scale. Iron metallurgy was probably at its lowest point. As a matter of fact the Damascene blade of the time of the crusaders was presumably a much lower class product than the cheap pocket knife of to-day. As for iron smelting, the relation between output and fuel and power used was not commercial. One merely had to turn out a certain amount of molten metal and have done with it. The actual product of the blast furnace was cast sometimes in the pig, and sometimes used directly in the forge. Usually it corresponded to the ordinary charcoal iron of to-day.

(To be continued.)

ALASKA UNITED GOLD

The report of the Alaska United Gold Mining Company for 1912, states that the Ready Bullion stamp mill crushed 216,454 tons of ore, and, in addition to the free gold, saved 6,128.07 tons of concentrate. Steam was used for power 149 days 3 hours and 23 minutes, and water 210 days 7 hours and 36 minutes. During the period noted above, 1 lb. of chrome steel in the shoes crushed 2.53 tons of ore and 1 lb. of iron in the dies (which are made by the Treadwell foundry) crushed 4.57 tons of ore. The cost of milling the above ore was $54,767, or $0.2532 per ton. The ore yielded in free gold, including base bars, $317,970, or $1.4690 per ton, and from 6,128.07 tons of concentrate treated $300,188, or $1.3868 per ton of ore milled, making the total returns for the year $618,158, or $2.8558 per ton of ore milled. The 700-stamp mill crushed 234,339 tons of ore and, in addition to the free gold, saved 4,704 tons of concentrate. Steam was used for power 175 days and water 183 days. During the period noted above 1 lb. of chrome steel in the shoes crushed 2.76 tons of ore and 1 lb. of iron in the dies (which are made by the Treadwell foundry) crushed 4.94 tons of ore. The cost of milling the above ore was $50,785, or $0.2167 per ton. The ore yielded in free gold, including base bars, $282,180, or $1.2041 per ton, and from 4,704.04 tons of concentrate treated, $294,951, or $1.2587 per ton of ore milled, making the total returns for the year $577,132, or $2.4628 per ton of ore milled. The cyanide plant, which is owned jointly by the Alaska Treadwell Gold Mining Company, the Alaska Mexican Gold Mining Company and the Alaska United Gold Mining Company was built to treat the concentrate made in their various mills, and has proved an unqualified success. It has operated continuously throughout the year, and treated 33,185 tons of concentrate, at an operating cost of $3.128 per ton, with an extraction of 97 per cent. In addition to the above, various additions and alterations were made to the plant, at a total cost of $19,984, or $0.60 per ton of concentrate treated. The principal items of the above construction charges consisted of the installation of a blast furnace and acid treatment unit in the refining room and the installation of additional filter and precipitation presses in the mill.

CANADIAN MINING INSTITUTE (WESTERN BRANCH)

The fifteenth general meeting of the Western Branch of the Canadian Mining Institute was held at Rossland, British Columbia, on May 22 and 23. As, by prior arrangement, this was a joint meeting of the Spokane Local Section of the American Institute of Mining Engineers with the Western Branch of the Canadian Mining Institute, it was attended by members of both institutes and greater interest in the proceedings consequently resulted.

Among those present representing the Spokane Local Section A.I.M.E. were Prof. R. S. McCaffery, of Moscow, Idaho, (chairman), professor mining engineering at the University of Idaho; Mr. L. K. Armstrong, of Spokane, Washington, (secretary), editor of the Northwest Mining News; Messrs. F. C. Bailey, Geo. Crerar, J. Cleveland Haas, and D. F. Strobeck, all of Spokane; Mr. H. W. Newton, of Republic, Washington, metallurgist and superintendent of the North Washington Power and Reduction Co.'s mill at Republic; Mr. Frank E. Pearce, manager for the Inland Mining Co., operating a gold mine and stamp-mill near Paulson, Trail Creek mining division; and E. E. Ward, superintendent of the Silver Hoard mine, in Ainsworth camp, West Kootenay. Members of the Western Branch, C.M.I., present were Mr. M. E. Purcell, of Rossland (chairman), superintendent of the Consolidated Mining and Smelting Co. of Canada's Centre Star-War Eagle group of mines; Mr. E. Jacobs, of Victoria (secretary); and Messrs. S. J. Blaylock, Lorne A. Campbell, Graham Cruickshank, S. S. Fowler, James McGregor, Alfred McMillan, Fred S. Peters, P. W. Racey, A. B. Ritchie, R. H. Stewart, and John Vallance. Some of the visitors were: Messrs. W. M. Archibald, Trail; Chas. A. Banks, manager Jewel gold mine and mill, near Greenwood; Chas. W. Drysdale, Geological Survey of Canada, Ottawa; A. S. Goodeve, Ottawa; H. H. Johnstone, Rossland; Prof. Arthur Lakes, Denver, Colorado; H. Perry Leake, Nelson; E. Levy, manager Le Roi No. 2, Ltd., Rossland; J. D. McDonald, local manager West Kootenay Power and Light Co., Rossland; E. G. Montgomery, assistant superintendent Centre Star Mines, Rossland; P. Newitt, superintendent Le Roi No. 2 Co.'s concentrator, Rossland; and Wm. Watson, New York, mining engineer.

THURSDAY EVENING SESSION.

The first session was held on Thursday evening, May 22, Mr. M. E. Purcell presided, and with him sat Prof. R. S. McCaffery. It having been arranged that the Mayor of Rossland would, on his return to town the following evening, welcome the visiting members of the two institutes and other visitors, the chairman briefly expressed gratification on behalf of his fellow citizens as well as himself, at the meeting being held in Rossland, and assured the visitors that everything practicable would be done to make their short stay in the "Golden City" and vicinity pleasant as well as instructive. Professor McCaffery in a few appropriate sentences thanked the people of Rossland for their hospitality, with the quality of which, however, he was not unacquainted, having last summer visited the camp with a party of mining engineering students from the University of Idaho. The business of the meeting was then proceeded with.

History and Geology of Rossland Camp.

The branch secretary said that while the Rossland Miner had placed before the visitors much information concerning the eventful history of Rossland camp since Bourjois and Morris staked several mineral claims on Red Mountain; had told of the ups and downs that had attended its development through the 19 years of its production; and had printed a table showing that during that period—1894-1912—there had been produced from local mines 4,104,228 tons of ore containing 2,018,152 oz. gold, 3,383,951 oz. silver, and 86,838,170 lbs. copper, together having a gross value of $55,577,452, he would still venture to give them a brief review of the camp from the beginning of mining here.

The construction of the Dewdney trail, which was built through to Wild Horse creek, East Kootenay, in the early sixties, provided the first means of access to what is now Rossland camp. It is on record that in those early days prospectors saw the iron-stained cappings of this neighbourhood and put down a few prospect holes, but the low grade of the surface ore and the long distance from smelting centres had a discouraging effect, for no development work was done until about 25 years later. In 1889 Joseph Bourjois staked the Lily May, alongside the Dewdney trail and distant a mile or two from the present town of Rossland. In 1890 he staked the Centre Star and War Eagle, while Morris staked other mineral claims. They also discovered the Le Roi, which became the property of Col. E. S. Topping. Late that year Colonel Topping interested Spokane men in the Le Roi and Mr. Oliver Durant arranged for them an option on a 16-30th interest under a six months' working bond. In the spring of 1891, after many vicissitudes had been experienced, ten tons of picked, pure sulphide ore from the bottom of a 35-foot shaft on the Le Roi, was packed down to Columbia river and shipped thence to Butte, Montana. Smelter returns gave about 4 oz. gold, and silver 3 oz. per ton, and copper 5.21 per cent. The bond was taken up, and afterwards the remaining 14-30th interest was sold by Colonel Topping to other men. The Le Roi Gold Mining Co. was then formed and some 70,000 shares sold at a lo wprice. The proceeds of the sale of these shares having been exhausted, work was suspended until the winter of 1893-4, when, a road having meanwhile been constructed from the Columbia up Trail creek to the claims, the ore that had been accumulated on the dump was hauled in sleighs to the river and shipped thence to the smeltery. The returns received gave a good profit, so active mining operations were begun, and the Le Roi mine was soon fairly launched on its career, which for some time was a very successful and profitable one. Other claims that were developed were the Centre Star, Idaho, and War Eagle. In February, 1895, the War Eagle, by this time controlled by Mr. P. Clark, of Spokane, and which had become one of the best mines in the camp, paid its first dividend, amounting to $32,500.

On October 10, 1895, Mr. F. August Heinze, then at the head of a smeltery in Butte, commenced the construction of smelting works on the west bank of the Columbia near the mouth of Trail creek, and in February, 1896, the first furnace there was blown in. Mr. Heinze's first contract with the Le Roi Company provided for the smelting of 37,500 tons of ore at a freight and treatment rate of $11 a ton, and for an additional 37,500 tons at similar rates to the lowest obtainable on the open market. A narrow gauge railway was constructed by Mr. Heinze from the smelting works to the mines. Later Spokane men established smelting works at Northport, Washington, a railway having meanwhile been constructed from the Spokane Falls & Northern Railway at Northport to

Rossland. In March, 1898, Mr. Heinze sold the Trail Smelting Works and the Columbia & Western Railway from Rossland to Trail, and thence up the Columbia, to the Canadian Pacific Railway Co., and afterward a separate company was organized to operate the smelting works, which company eventually developed into the present Consolidated Mining & Smelting Company of Canada, Ltd.

Mr. Jacobs also gave a short synopsis of Mr. R. G. McConnell's geology and mineralogy of the Rossland district, which was included in the "Summary Report" of the Geological Survey of Canada for 1896.

In connection with his comments on the notes just read, Mr. S. S. Fowler mentioned that in the early days, when travelling in a stage to the North Star mine, East Kootenay, with Joe Bourjois (Bourjois is stated to have located the North Star in 1892), the latter, during the three or four days' journey frequently lamented that his partner had sold the War Eagle for too low a sum—only $45,000, which, however, Mr. Fowler thought was a fair price for the prospect that property then was.

Mr. Banks asked whether the ore still holds out at depth in Rossland mines, and what depth had been reached. In reply, the chairman stated that the aggregate gross value of the ore produced to date had been in excess of $55,000,000, and that the bottom of the deepest shaft in the Centre Star is 2,300 ft. from its collar.

Oxygen Helmets in Mine Fires.

The next paper was on "The Use of Oxygen Helmets in Mine Fires," by Mr. E. P. Dudley. This was a statement of experience in connection with a fire that took place last autumn in the Bunker Hill and Sullivan mine at Kellogg, Coeur d'Alene district, Idaho. In the absence of the author, the paper was read by Professor McCaffery. The fire under notice occurred in October, 1912, and the usefulness of oxygen helmets in fighting underground fires was well demonstrated on that occasion, for men wearing them were able to get to where the fire was burning, and, notwithstanding that they had to work in thick smoke, to extinguish it. Incidentally, the advantages and disadvantages of the oxygen apparatus of different makes were commented on.

The Draeger Pulmotor.

Half an hour was next spent in demonstrating the use of the Draeger pulmotor, which apparatus had been kindly lent by the Provincial Department of Mines for demonstration purposes. The secretary stated that although he had had the method of using the apparatus explained to him, he was not sufficiently familiar with it to show it to best advantage. However, Professor McCaffrey showed the working of the machine, interest in which was general. It was explained that this device is intended to induce respiration in those who have been overcome by noxious gases, those apparently drowned, and those unconscious from electric shock. Oxygen is forced into, and drawn out of, the lungs by this machine. Testimonials as to its efficacy in a number of cases under varying conditions, were read. Several of those present stated their respective experiences in restoring to sensibility men who had been overcome, and the opinion was expressed that in some cases the usual muscular exercise of the patient would aid greatly in restoring him. Mr. Fowler thought all present at the meeting would agree with him that an excellent purpose had been served in thus bringing to their notice the usefulness of the pulmotor, and the branch secretary and the Department of Mines deserved their thanks for having afforded them an opportunity of seeing the machine and the ease with which it could be used in case of necessity.

Ore-Sorting and Handling Arrangements.

"Surface Ore-Handling and Sorting Arrangements at the Centre Star Mine," was the title of a descriptive paper contributed and read by the chairman, Mr. Purcell. As the visitors were to go to the mine the next day, the notes Mr. Purcell had prepared were timely and of more than ordinary interest. The dumping, screening, crushing, sorting, sampling, and shipping arrangements were briefly described, and the makes, dimensions, and capacity of the various machines and appliances were given.

Copper-Smelting Plant at Trail.

At the request of the chairman, Mr. Fowler read a paper, by Mr. James Buchanan, superintendent, descriptive of "The Copper-Smelting Department of the Consolidated Mining and Smelting Company of Canada's Works at Trail, B.C." This paper described concisely the ore-receiving arrangements; crushing and sampling plant; ore and coke haulage facilities; charging of blast furnace and their dimensions and smelting capacity; copper-matte concentration; disposal of matte and slag; analyses of ore, matte and slag; details of construction of blast furnaces; sites, displacement capacity, speed, and motive power of blowers; and arrangements for collecting and briquetting flue dust, etc.

Electrolytic Lead Refinery.

The last paper on the programme for the evening was one by Mr. J. F. Miller, superintendent of the Consolidated Mining and Smelting Co.'s Electrolytic Lead Refinery at Trail, descriptive of the refining plant and process. This paper was read by the branch secretary.

After mentioning that the base bullion to be refined contains about 97 per cent. lead, the remaining 3 per cent. consisting of gold, silver, antimony, arsenic, copper, zinc, and traces of other metals, Mr. Miller showed the course followed in treating the bullion from the lead furnace, through the refining tanks, and thence to the melting pots and finally to the moulds in which are cast the pigs of refined lead. The treatment of the slime which contains the precious metals of the original base bullion, was also described—its removal from the anode, filtering, drying and roasting, and melting in the reverberatory furnace. The parting of the gold and silver contained in the dore metal product of the reverberatory, and the final treatment of gold and silver, respectively—the former leaving the refinery with an assay value 995 fine or better, and the latter 999.54 fine—were also described. Incidentally, the Miller sheet-casting machine, an ingenious device for making cathode starting sheets, was mentioned and its operation indicated. Reference was also made to the pipe-making plant, for the manufacture of lead pipe of various sizes. Finally, brief notes were given of the treatment of the solution of copper sulphate produced in precipitating the silver—its evaporation and crystallization, and the bluestone or blue vitriol product made for use by fruit growers wheat farmers, and others.

Votes of thanks were passed to the respective contributors of papers, and then adjournment was made to the following night.

VISITS TO MINES AND SMELTERY.

On Friday morning, 23rd, the visitors were taken down the Centre Star mine and shown some of the workings and ore bodies in that and adjacent mines of the group. Of course only a very small part of the extensive workings was seen, for the aggregate footage of development work underground in the Centre Star group is more than 30 miles, and there is fully 14 miles in the adjoining Le Roi mine, also owned by the Consolidated Co. The big hoisting engine, compressors, ore handling and sorting plant, machine and other shops, and various other plant and machinery, were seen, and then the assay and general offices were visited. In the latter a glass model of the Centre Star and War Eagle mines proved an object of especial interest.

After luncheon, the party was taken in automobiles to Trail, where the afternoon was spent in examining the Consolidated Co.'s extensive works, including the copper and lead-smelting plant, this having many modern features and employing up-to-date methods of handling and reducing ores and matte; and the electrolytic refinery. This visit was the more interesting and instructive from the fact that informative papers by the smeltery and refinery superintendents, respectively, had been read the evening before, so that the visitors had previously had the benefit of hearing read concise descriptions of the works.

At the mines, Mr. M. E. Purcell, superintendent; Mr. E. G. Montgomery, assistan superintendt; Mr. Fred. S. Peters, superintendent of the Le Roi, and several heads of departments were most assiduous in their attention to the visitors, while at the smeltery and refinery, Mr. R. H. Stewart, general manager; Mr. S. G. Blaylock, assistant general manager; Mr. Jas. Buchanan, superintendent of the smeltery; Mr. J. F. Miller, superintendent of the refinery; and other officials, also did all in their power to make the visitors enjoy their visit to these works, the production record of which during 16 years, to July 1, 1912, is as follows: Ore smelted, 3,143,927 tons. Metals produced—Gold, 1,146,912 oz.; silver, 20,224,623 oz.; lead, 250,970,644 lbs.; copper, 50,789,983 lbs.; gross value, $52,167,004.

FRIDAY EVENING SESSION.

The second session held on Friday evening, May 23rd, was even better attended than was the first, for while about 50 were present the first evening, there were at least a score more at the second session. Mr. Purcell again presided.

The Mayor of Rossland, Mr. J. S. Deschamps, gave the visitors a hearty welcome to the city, and assured them of the desire of the citizens to do all they could to make their visit such a pleasant one that they would want to come again. He made brief reference to the importance of the local mining industry, and added some information relative to fruit growing, farming, and lumbering interests that, together contribute materially to the prosperity of Rossland and vicinity.

Mr. A. S. Goodeve, formerly a prominent citizen of Rossland, but now a member of the Railway Commission of Canada, at the request of the chairman, also addressed the meeting. Mining, he said, was the great basic industry. Mining engineers, without much outward show or fuss, are solving great problems and are wresting from Nature some of her hidden secrets. There is no wealth so free from taint as that taken from the earth. In mining there is neither competition nor rivalry. If many times more value is being taken out of one mine than another, there is no hurtful competition in this being done. He gladly welcomed the visiting engineers, who are members of a great and useful fraternity. He alluded to the great extension of the railway systems of Canada in recent years, and its effect on the mining industry of the Dominion, in which there occur enormous deposits of minerals of various kinds. Coming to the local mining industry, while the earlier excitement had passed away, Rossland's mines are still producing largely, and there are indications that make it appear their mineral production of the future will be larger than that of the present.

Mr. L. A. Campbell, M.L.A., general manager of the West Kootenay Power and Light Company, thought it probable those of the visitors who had not been to Rossland and Trail before, had been much surprised at what they had that day seen in the mines and the smelting works. The mines in that camp were first opened by men from south of the International boundary line, who worked them to a certain stage; then, when they thought ore of good value would not be found at greater depth, they sold out to Old Country men, and in due course the Englishmen sold to Canadians who have made a decided success of their mining operations in Rossland camp. He thought that if a comparison were made between the mineral-bearing country in Mexico, in the United States, and in Canada, it would be found that the Dominion had much the largest area of mining country. As yet, though, there had not been a great deal of mining done, except on the southern fringe of this large extent of mineral territory. He believed Canadians would make a success of mining in the North, as they have done in the South of British Columbia, and he was glad to see that the Granby Co. had made such a promising beginning in the vicinity of Observatory inlet. There is lots of room for mining exploitation and development in this province and other parts of Western Canada, and he would like to see more men with means and experience come in and assist in developing the great mineral resources of these parts of the Dominion. He joined in extending to the visitors a hearty welcome to Rossland, and hoped to see more mining engineers from across the boundary line taking part in the development that increased activity in mining bids fair to soon bring about.

The chairman on behalf of the Western branch of the Canadian Mining Institute, thanked the several speakers for their welcome and for their encouraging references to the progress of mining in the Canadian West. He would presently ask Mr. L. K. Armstrong, of Spokane, to respond on behalf of the visiting members of the American Institute of Mining Engineers, but before doing so would mention that it had been his privilege early in March to attend the Annual Meeting of the Canadian Mining Institute, held in Ottawa, where, as chairman of the Western branch, he had been the guest of the Council of the Institute. At the annual dinner, among those who spoke were the Right Hon. Mr. R. L. Borden, Prime Minister of Canada, and Sir Wilfrid Laurier,the distinguished leader of the Opposition. He had been greatly pleased to hear the Hon. the Prime Minister say that his Government will be ready to co-operate with the Canadian Mining Institute in any reasonable measures having for their object the advancement and benefit of the mining industry of Canada, and Sir Wilfrid had stated that he was entirely in accord with that assurance. When the toast of "Mining" was proposed, he, as the representative of the Western branch, had been honoured by having his name coupled with it, and in the course of his response, after having pointed out the growing importance of the mining industry in British Columbia and its enormous potentialities and possibilities, he had acknowledged the valuable assistance the West had received and is continuing to receive from the Dominion Department of Mines—from the Geological Survey branch, especially, and in smaller measure from the Mines branch. In conclusion, he had expressed his deep sense of appreciation of the great importance of the assurances of the Hon. Mr. Borden and Sir Wilfrid Laurier of their sympathetic and helpful attitude toward the mining industry, and had told them that it would give him great pleasure to inform mining men in British Columbia that they might rely upon the Federal Government giving them aid in every legitimate way, which information would doubtless prove a message that would cheer them in their work and encourage them to even greater efforts.

Mr. Armstrong briefly acknowledged the kindness so freely extended to the visitors from Spokane and other places south of the International boundary line, and said that what they had that day seen in the mines and the smelting works and refinery had indeed been a revelation to those of their number who had not previously visited them. They had been well repaid for having attended this joint meeting of members of the two institutes and he sincerely hoped that other similar meetings would be held in the future.

Two More Papers Presented.

Professor McCaffery presented a paper entitled "The Effect of Lime on the Solubility of Silver in Cyanide Solutions," which had been prepared by Mr. H. W. Foester, of Nampa, Idaho. As it was of a technical nature, its contents were only briefly outlined and then, at Professor McCaffery's suggestion, it was taken as read.

Similarly a paper by Mr. Chas. J. Murphy, of Fernie, B.C., chief engineer for the Crow's Nest Pass Coal Co., entitled, "Mining and Metallurgy as Practised in the Sudbury Nickel Fields, Ontario," was presented by the branch secretary, who gave a short synopsis of it, and, as time was short, suggested that it be read by title, which was done.

Metal Mine Accidents and First Aid.

Mr. E. Jacobs said that he had compiled from various sources some information relative to the subjects of "Metal Mine Accidents" and "First Aid to the Injured," the importance of attention to which matters is gradually being generally recognized. He mentioned having heard a most interesting and instructive address, illustrated by many effective lantern slide views, made by Dr. W. H. Tolman, of New York, director of the American Museum of Safety, before the 1912 Annual Meeting of the Canadian Mining Institute, and afterward he had visited the Museum of Safety in New York. He now had before him a technical paper on "Metal Mine Accidents in the United States During 1911," issued by the U.S. Bureau of Mines, which paper contained much statistical and general information concerning metal mine accidents. There had recently been sent out from Pittsburg, Pennsylvania, a printed circular showing the purpose of the "American Mine Safety Association," which is designed "to conserve the lives and health of miners and reduce property loss." He had with him, too, a synopsis of the New Zealand Safety Commission Report, printed in the Engineering and Mining Journal, New York, of April 26, ultimo. Then there were, as well, several papers printed in volumes of the Journal of the Canadian Mining Institute, from which he had obtained notes. But since it was desired to adjourn that meeting early, he would read only some brief extracts from the considerable amount of information he had gathered.

In regard to metal mine accidents, Mr. Jacobs quoted briefly from a paper read before the Canadian Mining Institute at its Annual Meeting in Montreal in 1909, by Mr. E. T. Corkill, of the Ontario Bureau of Mines, as follows: "In metalliferous mining an accident seldom occurs in which a considerable number of men are killed, the fatalities usually being one or two at a time, though in the course of a year they may amount to a large total. Public opinion is, therefore, not aroused; the management of the mine is not so impressed with the importance of careful supervision; the miners are aroused for a few days and then forget, and the same conditions prevail as before. It is a common belief among most metal miners that the fatalities in coal mines far exceed those in metalliferous mines. This is a great mistake, and, while it is not proposed to argue that metal mining is as hazardous a calling as coal mining, it is desired to impress upon all metal miners that only care and close supervision of their work will lessen the number of accidents and place metalliferous mining on the list of less hazardous occupations."

Figures quoted by Mr. Corkill showed that in Great Britain and Ireland the average deathrate per 1,000 men employed for the ten years from 1898 to 1907 in coal mines was 1.40 and in the metalliferous mines 1.14. In 1906 the deathrate in the German Empire was, in coal mines, 1.70 per 1,000 men employed, and in metal mines, 1.29. For the same year the United States figures were 3.21 per 1,000 in the coal mines, and 3.22 in the chief metal mining States. It may be added that in British Columbia, for the same year it was 4.61 per 1,000 men employed in the metal mines.

British Columbia's official record shows that in ten years, 1902-1911, both inclusive, there have been 162 fatalities in the metal mines. The deathrate for the eight years, 1904-1911, shown in published official reports, ranged from 3.89 in 1905 to 5.93 in 1908. The figures for three recent years are: For 1909, 4.9; 1910, 4.19; 1911, 5.24 per 1,000 employed. While the 1912 returns are not yet available, it is believed they will show a lower deathrate, since the chief inspector of mines and all the other mine inspectors have been giving particular attention to these matters.

In common justice to Rossland camp it should be mentioned that comparatively few fatalities have occurred in local mines, during the last four years especially.

Turning to First Aid, Mr. Jacobs mentioned that the Canadian Pacific Railway Co. employs its own instructors in St. John Ambulance First Aid work. This work has assumed large proportions, as shown by the fact that 4,000 men employed by the company west of Winnipeg have received First Aid instruction, and 3,700 of these have successfully passed the examinations held after the instruction had been given. C.P.R. employees, familiar with First Aid methods, have treated on the spot fully 7,000 persons more or less injured, and only the more serious cases required removal to the hospital.

While the St. John Ambulance First Aid movement has been and is receiving much attention in the larger cities of the British Columbia coast, and in the more important coal mining centres, Mr. Jacobs said that, so far as he knew, there had not yet been organized a St. John Ambulance Association centre in even one of the metal mining centres of British Columbia, which is much to be regretted. He stated, shortly, the chief objects of the association, and mentioned that printed literature on its efforts and the results achieved in the province could be obtained gratis on application to Major F. C. McTavish, M.D., secretary of the British Columbia Council.

A Locked Cap Box.

The branch secretary showed a locked dynamite cap box, for mine use, patented by Mr. A. S. Hamilton, master mechanic for the Western Fuel Co., Nanaimo, Vancouver Island. Two sizes of this carrying case were exhibited—a larger one for use in mines and a smaller one suitable for prospectors to take with them when prospecting. The device consists essentially of an aluminum cylinder in which holes are drilled for holding the caps. The box is cored out inside the cap-holding part, except for a small stub left in the centre to which disks forming the cover are attached. Different sizes are made, from one to hold 15 caps up to one with a capacity of 60 caps. While generally used in coal mines about Nanaimo, this safety box has not yet been introduced into metal mines.

The Pulmotor Again.

The pulmotor again received much attention, numbers of men who had not seen it the first evening having attended after having heard friends speak of its evident utility. Professor McCaffery once more demonstrated the method of using it, and there was a general opinion that it is desirable the machine shall be obtained for use in cases of emergency in Rossland mines.

Report on Rossland Camp.

The secretary read an extract from a letter he had received from Dr. R. W. Brock, Director of the Geological Survey of Canada, as follows: "Dr. C. W. Drysdale, of this department, is going to work this season at Rossland to bring the information up to date and to familiarize himself with local conditions so as to be able to edit the report on Rossland camp, which my duties as Director have prevented my undertaking. I am happy to at last be able to put a good man on this work and trust that the report will now be completed." Dr. Drysdale was present at the meeting.

Chairman's Remarks.

The chairman quoted some facts and figures from the "Preliminary Review of Mining in British Columbia in 1912," prepared by the Provincial Mineralogist, and published early in the current year by the Provincial Department of Mines. In particular, he directed attention to the fact that the net profits of metalliferous mining companies operating in the province exceeded $3,000,000 last year. He also gave prominence to the comparative figures of mineral production in all years, these showing that while the aggregate value of the minerals produced in British Columbia during 51 years, 1852-1902, was $189,729,000, that for ten years, 1903-1912, was about $240,574,000, or nearly 57 per cent. of the aggregate value produced in 61 years. Further, the value of the production of the last five years, 1908-1912, had been rather more than 30 per cent., or nearly one-third of the aggregate of the whole period of 61 years for which official statistics are on record.

Mr. Purcell then acknowledged the assistance he had received from the branch secretary and other members during his term of office as chairman of the branch; spoke appreciatively of the substantial financial assistance the branch received from the Provincial Government, and the interest of the Hon. the Premier and Minister of Mines, Sir Richard McBride, in the mining industry and the work of the Canadian Mining Institute; expressed gratification that there is now a prospect of the report on the structural survey of Rossland and vicinity being completed without unnecessary delay, and reminded all present that next August important visitors may be expected in Rossland when an excursion party is to come to the camp under the auspices of the International Geological Congress, to meet in Toronto next summer.

Votes of Thanks.

The branch secretary moved a comprehensive vote of thanks—to the chairman of the branch (Mr. M. E. Purcell) for his valuable services during his year in office in which he had attended the Semi-Annual Meeting of the Institute in Victoria last September, the American Mining Congress in Spokane last November, and the Annual Meeting of the Institute in Ottawa in March; to their visitors from across the international boundary line for attending the meeting and co-operating in making it the success it undoubtedly had been; to the Nelson "Daily News" and the Rossland "Miner" for the considerable publicity they had given the proceedings in connection with that meeting; to the various mine and smeltery officials who had been at so much trouble to show the visitors the mines and reduction works; to the vocalists and instrumentalists who had kindly contributed music that evening, and to the citizens of Rossland who had combined to welcome the visitors so heartily. In asking Mr. L. K. Armstrong, secretary of the Spokane Local Section, A.I.M.E., to second this resolution, he observed that it was Mr. Armstrong who first suggested that joint meeting and had interested others in assisting to carry it through.

Mr. Armstrong in seconding the motion, on behalf of the Spokane Local Section of the American Institute of Mining Engineers, asked the area of the more productive portions of the camp, and on being told it was a quarter of a mile wide by a mile in length, said if he were going to file on a quarter section of land here he would take up that rich quarter section. In earlier days Rossland was considered a copper camp, but now the results showed that it is a gold camp. He again spoke of the surprise of himself and colleagues while visiting the mines, the smeltery and the refinery. In the last they were making lead pipe and turning out sulphate of copper and fine gold and pure silver. He said it was an object lesson to himself and other visitors. The fact that the mines, the smeltery and the refinery were close together, and that the processes begin with the ore in the mine and end in the manufactured product, without haulage over very long distances from one plant to another, showed the wisdom of a close and comprehensive plan which might well be copied.

The vote of thanks was then unanimously adopted.

The visitors then adjourned to the Rossland Club, where they were pleasantly entertained with refreshments and music by the Club until after midnight.

BUSINESS MEETING OF C. M. I.

On Saturday morning, May 24, there was held a meeting of members of the Western branch of the Canadian Mining Institute to transact some routine business. The chairman of the branch, Mr. M. E. Purcell, presided.

The secretary's report and audited statement of receipts and expenditure for the past year, ended April 30, were presented, and, on motion, were adopted. The accounts showed that a grant of $1,000 had been received from the Provincial Government, and this, added to the balance in hand from the year to May 1, 1912 ($267.25), made a total of $1,267.25 on the receipts side. Of this total there had been expended during the fiscal year under review, $948.60, leaving a balance in the bank of $318.65. On comparison, it was noted that the year's expenditure had been lower than in either of the two immediately preceding years. The secretary reported that the Provincial Government grant for the current year had quite recently been paid into the bank to the credit of the branch, as per acknowledgment submitted to the meeting.

Messrs. L. K. Armstrong and J. Cleveland Haas were appointed scrutineers, and they examined and counted the ballots handed to them in sealed envelopes as received by mail. Their report showed that the following had been elected: As Chairman of the branch for the ensuing year, W. J. Sutton, Victoria. As Branch Councillors—For Cariboo, John Hopp, Barkerville; Crow's Nest, W. R. Wilson, Fernie; East Kootenay, C. H. McDougall Marysville; Slocan, W. E. Zwicky, Kaslo; Slocan Lake, Douglas Lay, Silverton; Nelson, S. S. Fowler, Riondel; Lardeau, F. Chas. Merry, Ferguson; Nicola Valley, Charles Graham, Middlesboro; Vancouver, W. H. Armstrong, Vancouver; Mainland Coast, O. B. Smith, Vancouver; Vancouver Island, Thomas Graham, Victoria; State of Washington, J. Cleveland Haas, Spokane, Wash.

Members, ex officio, of the Branch Council are: Messrs. Frederic Keffer, Greenwood; R. H. Stewart, Trail; Wakely A. Williams, Grand Forks; Wm. Fleet Robertson, Victoria; R. R. Hedley, Vancouver; and M. E. Purcell, Rossland.

As this was the first opportunity of placing on record the re-appointment of E. Jacobs as branch secretary, it was resolved that this re-appointment be entered on the minutes.

A hearty vote of thanks to the chairman and secretary, respectively, for their services in the interests of the Institute during the past year, was passed. Cordial appreciation was expressed of the co-operation of the members of the Spokane local section of the A.I.M.E., in making the meeting at Rossland so successful, and especially at a number of them having attended it, and it was hoped this would prove to be only the first of a number of similar joint meetings.

Professor McCaffery mentioned that the Spokane Local Section intends holding its fall meeting in October at Wallace, Ihado, in which vicinity flotation processes and other methods of great interest to mining and metallurgical men are being adopted. He hoped as many as practicable of the members of the Western branch of the C.M.I. will also attend, and so make it a joint meeting.

ROCK HOUSE PRACTICE OF THE COPPER RANGE CONSOLIDATED COMPANY*

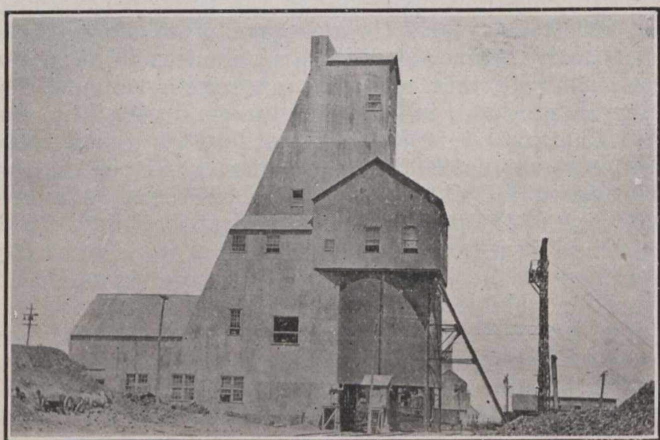
By H. T. MERCER, Painesdale, Mich.

The methods of handling copper rock in preparing it for the stamp mill have undergone some notable changes in the past few years, and it is the object of this paper to describe briefly some of the methods, past and present, peculiar to the Michigan Copper Country. As one locality is similar to another in many respects, I shall confine myself principally to the Copper Range Consolidated Company's mines.

The ends to be attained in a rock house are: The separation of the waste rock and copper rock, segregation of the mass copper, and the reduction of the stamp rock to a size suitable for the mill. The first step on reaching surface is the dumping of the rock, and it might be well to consider the various types of dump used.

In the early life of our mines the rock was dumped from skips holding about two and one-half tons by means of the old-style dump, more or less common, throughout the country. In this dump the main stringer was cut away at the side sufficiently to allow the front wheel of the skip to drop through on a curved rail, toward the foot, or downward, the rear wheel continuing in the plane of the dip, on an outer rail or strap, the tread of the rear wheel being wider than that of the front. Later, to accommodate a longer skip of about four and one-half tons capacity, this side, or outer rail, was curved outward, or towards the hanging. This was to throw the rear of the skip out, so that the nose would not project too far into the dump. Later, when a six-ton skip was introduced, a dump was developed by Mr. John Angove, carpenter foreman at the Champion mine, in which the outer or back rail was raised still higher, and the main stringer continued through the dump without cutting, the front wheels remaining on the main track. In this dump the whole operation of dumping is performed by the rear wheels and curved outer rail. The nose of the skip is prevented from falling back by 12-inch iron rollers with a 4-inch face, placed between the main stringers in the proper position, 1x4 inch straps on skip bottom engage these rollers. By inserting a hinge in the tail end of the curve which intercepts the rear wheels, it may be raised, allowing the skip to pass through without dumping. It is therefore possible to place this dump at any point in the shaft and use it as a poor rock dump, without weakening the main stringers in any way.

In our old rock houses, the rock on leaving the skip dropped on an iron door about 5 feet long, set at an angle of about 30 degrees, below which, set at the same angle, were the screen bars, or grizzlies. The iron door was hinged at the lower end and could be raised to allow for the dumping of waste rock into a separate bin or car, underneath the skip track.

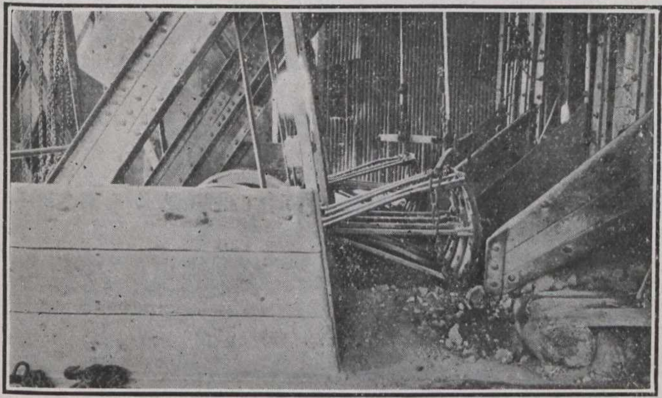


A Copper Range Rockhouse

The grizzlies were first constructed of 4-inch round iron bars, about 12 inches long, set 4 inches apart. These were later discarded in favour of 3x10 inch hardwood bars capped with 1x4 inch iron straps. The latter were cheaper and easier to replace than the round bars. At the lower end of the screen was a four-foot drop to the

*Prepared for Houghton Meeting of the Lake Superior Mining Institute August, 1912, and printed in Transactions. Vol. XVII., pp. 283-289. Photographs by R. E. Hore.

floor, and at this point in the floor several bars or rails were inserted, set 4 inches apart, at right angles to the grizzlies, forming a floor screen. Any fine dirt that had



Bin Chutes and Crusher Gates

failed to drop through the grizzlies could be shoveled through this floor screen to the storage bins below.

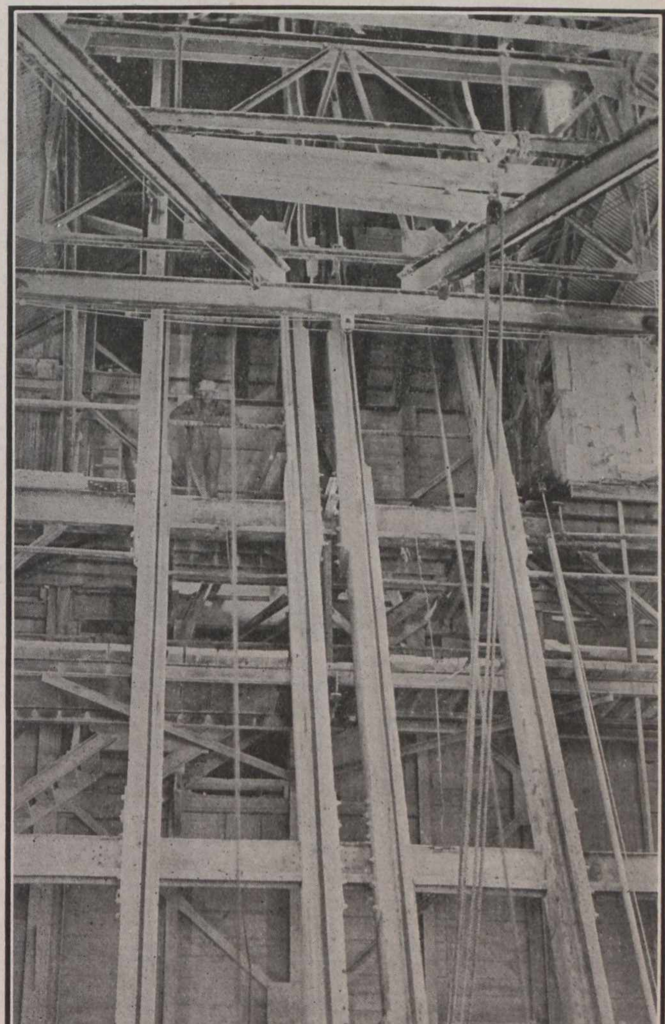
The crushers used at that time were of the jaw pattern 18x24 inch in size, and ran at a speed of 85 to 90 r.p.m. There were two of these crushers, one in front of each grizzly, and about 12 feet away, the floor between the crusher and the grizzly being paved with heavy plates. This long space was to allow for sorting and picking of mass, but necessitated a great deal of shoveling to get the rock to the crushers. The mass copper was picked out and taken, by hand, across the floor to a drop hammer, where the surplus rock was pounded off. It was then thrown through a chute to the ground, where it was collected and teamed to a central point, to be loaded onto a car and shipped to the smelter. Pieces of rock too large for the crusher were also taken to the hammer and broken. The finer pieces resulting were dropped through an opening in the floor to the bins and the large pieces taken back to the crushers.

Beneath the crushers were the large storage bins, from which the rock was loaded into cars by means of the ordinary apron chutes operated by separate hand levers. Any waste sorted on the crusher floor was transferred by head or barrow to the poor rock car, which ran on a track a little below the level of the main floor. Most of the waste, however, was hoisted seperately, dumped directly into the poor rock car and trammed out on to the waste rock pile by the rock house crew.

Such, briefly were the methods in use ten or twelve years ago. Let us turn now to the newer method and see what has been accomplished.

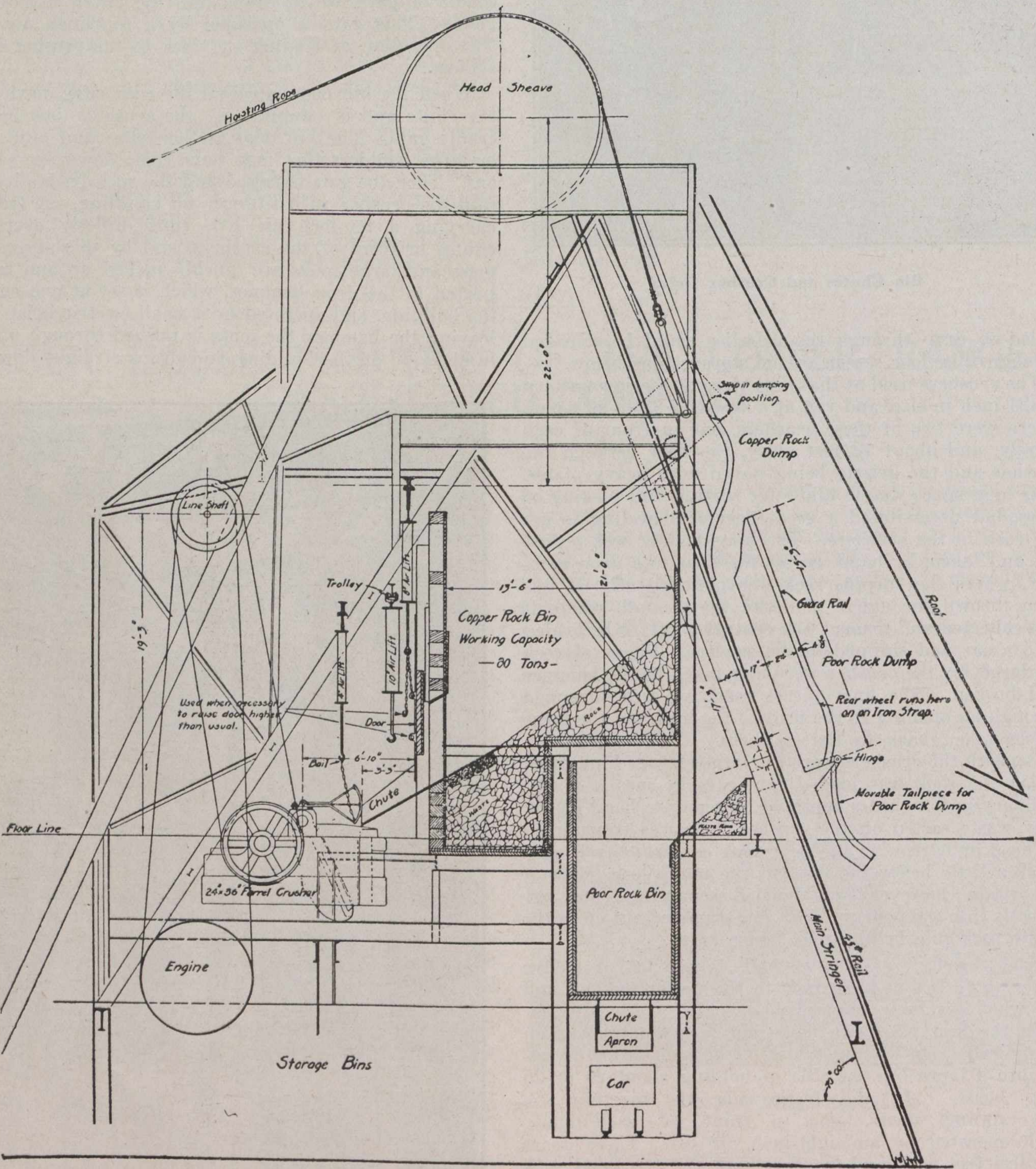
In the first place, we have done away entirely with the grizzly. On leaving the skip, the rock drops directly into a large bin, capable of holding about 20 or 25 skip loads. In the front side of this bin are two sliding doors, one in front of each dump, each operated by an eight-inch air lift. These doors are five feet wide and five feet high and are lined with two-inch cast iron plates. The front of the bins above the door is also lined with iron to protect the wall from the impact of the rock. The bottom of the bin is about two feet below the bottom of the doors and this space is filled with waste rock until it takes its natural slope to the door. No paving is used except near the door, where a heavy iron plate projects into the bin at an angle of 30 degrees, to help in starting the rock through the door. Outside of the bin, in front of each door, is an apron or chute about four feet long, set at 30 degrees. The lower end of the chute rests directly on the jaw of the crushers, which is a Farrell type 24x36 inch in size, run at a speed of 155 to 185 r.p.m. They are designed for as high as 300 r.p.m. There are two of these crushers, one in front of each door. Each crusher has a capacity of from 500 to 1,000 tons daily. Fastened to a shaft on the top of the crusher, by means of arms, is a cradle or gate, which drops into the lower end of the chute. This gate is operated by a four-inch air lift. The operation of feeding the rock to the crusher is as follows:

When the bin door is raised the rock runs down into the chute and is stopped at the crusher jaw by the cradle gate. The bin door is then shut and any mass or large boulders that may have come down are sorted out. Then the gate is raised and the rock feeds directly into the crusher with little or no handling. A trolley, carrying a ten-inch air lift, runs directly over the chutes in front of the crushers, and by this means the mass and large rocks are quickly picked up and transported to the drop hammer, which is set at one end of the building, and operated by a small electric hoist. On leaving the hammer the mass is pushed through a door in the side of the building and drops straight down to



Interior of Shafthouse, Champion Mine

a platform alongside of the railroad track. This platform is built of log cribbing filled with waste rock, the top being at the same elevation above the track as an ordinary flat car. Hinged on the side of the rock house above the platform, in such a position that it swings out over the car, is a simple jib crane, built of an 8-inch I-beam, 10 feet long. On this beam runs a trolley to



Sectional Elevation of Rock House of the Champion Copper Co.

which a chain block can be attached. By this means the mass copper is easily loaded onto the car. The larger masses are picked up with a chain, and an iron pan swinging on chains, is used for the smaller pieces. No sorting of poor rock is done in the rock house. All waste hoisted is dumped into a separate bin by means of a lower hinged dump such as has already been described. From this bin it is loaded into a car, trammed out on a trestle and dumped through a raise into the old stopes.

At several of our shafts where the poor rock trestle is of sufficient height bins have been built near the end of the trestle, about 6 feet back from the hole, or raise. Over these bins just under the car track, is a screen or grizzly, about 10 feet long, with bars 1½ inches apart, set at an angle of about 35 degrees. When the car is dumped, the waste rock slides over the grizzly. The larger pieces go over into the raise and the fines drop through the screen into the bin, where they become available for road material and concrete. When no rock is being drawn from the bin it simply fills up to the screen, and everything goes over into the mine. At one of our rock houses, where the old screen bars are still in use, and the crushers are set 12 feet away from the screens, large feed pans or "tilting" pans have been installed, similar to those in use at some of the Calumet & Hecla rock houses. The pans are hinged at the crusher end, and extend from the crusher to the grizzly. At the screen end they are attached by means of a bail and chains to a large air lift, by which they are operated. On being raised they stand at an angle of about 38 degrees and feed the rock to the crushers.

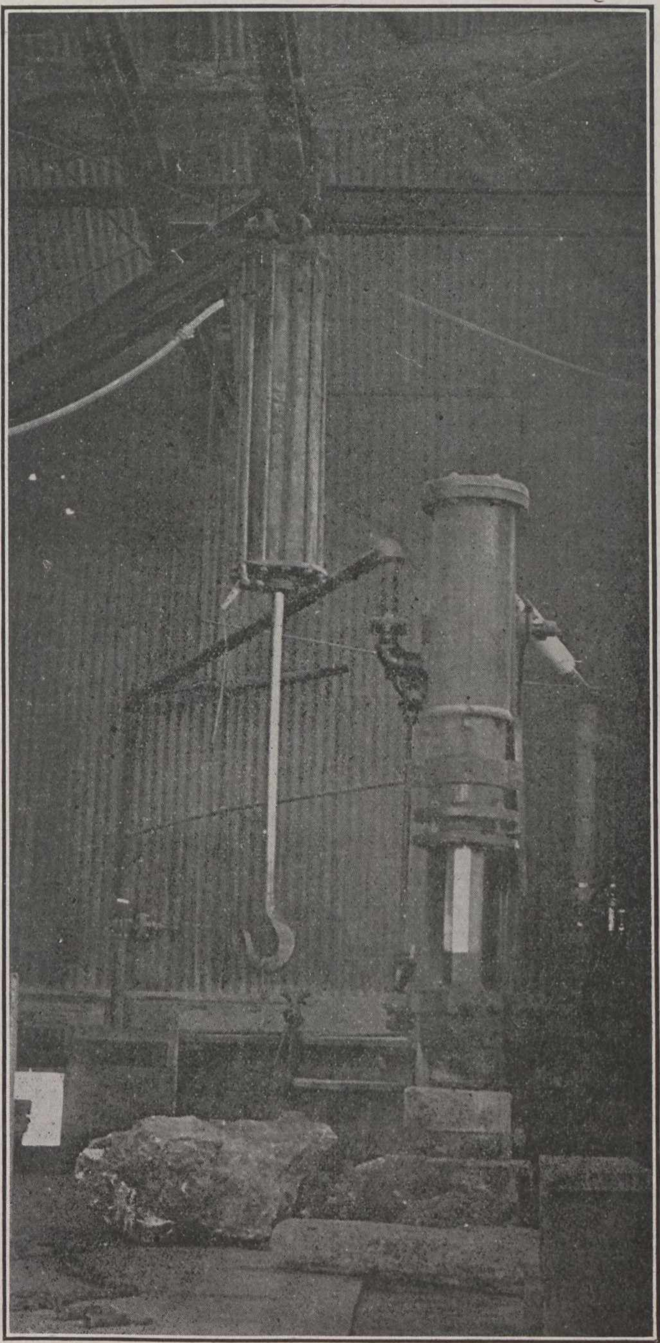
The main storage bins at the older rock houses are of the rectangular pattern, with sloping bottoms. The rock is drawn from these bins by means of apron chutes, operated by long levers. Of late years most of the rock houses built are provided with large circular steel tank bins, of great capacity. The loading chutes in these circular bins are set in the bottom directly over the centre of the railroad track. They are an improved pattern closed by small doors, operated by a system of levers from one central point. These new style chutes are more easily operated than the old aprons, and will probably replace the latter at our older rock houses.

Let us now consider what has been gained by these changes: First, the large dump bin obviates the necessity of stopping the hoist in case of an ordinary delay at the crusher, such as the stopping of the crusher by a mass, etc. Second, we do away with screen bars and the expense of their upkeep. Under the old system Sunday repair work was a big item, since introducing the direct feed scheme, Sunday work has been almost entirely done away with. The sliding doors and chutes last from two and one-half to three years, or longer, as do also the cradle gates at the crusher.

Perhaps the biggest saving however, is in labour. Formerly a rock house crew consisted of 6 to 8 men. At present two men will handle easily all that is hoisted.

Handling of mass copper and large boulders has been made comparatively easy by means of air lifts, trolleys and cranes, and whereas in olden times a rock house was about the hardest job around the mine, it has now become one of the easiest. Finally, to sum up the advantages in terms of actual saving in cost the comparison of rock house expense before and since remodelling is as follows:

		Cost per ton		
Year.	Tons Crushed.	Labor.	Supplies, etc.	Total
1906	671,785	$0.0629	$0.0342	$0.0971
1911	734,392	0.0262	0.0283	0.0545



Air Lift and Steam Hammer for Handling and Cleaning Mass Copper

MINING METHODS AT PORCUPINE

By A. A. COLE.*

Winning the gold at Porcupine presents no very novel difficulties to overcome, so the modes of mining used are the standard methods adopted on somewhat similar conditions in different parts of the continent. Two different types are exemplified in the Dome and the Hollinger, the former using the "Open-cut" or "Glory Hole" method, and the latter, the regular underground method, with the "Shrinkage stope" system. In both systems the initial work is usually similar. After the timber is cleared off, the surface is stripped or trenched to locate the veins. Vertical shafts are then sunk at suitable points, and levels are opened up, usually at 100 foot levels, though intermediate levels are sometimes run for local reasons. Reciprocating air piston drills are used, the favourite size being the 3⅛-inch machine. Except when the stopes are wide, the small hammer drills have come into very general use for stoping.

In some shaft sinking recent practice favors the adoption of small plugger drills in preference to the heavier reciprocating piston drills. The advantages claimed for the plugger drill are:

*Extracts from report to the T. & N. O. Ry. Commission, on mining in Northern Ontario in 1912.

1. Lighter and therefore more easily handled, hoisted or lowered.

2. Only three men are required to handle two machines, instead of four men for two of the piston machines.

3. Time taken to set up and tear down the larger machines is saved, and the actual drilling time is thus increased.

4. A greater footage of drilling is even claimed for the smaller machine in a given length of drilling time.

5. Fewer holes can sometimes be used to break a round, by drilling a few holes at a time, and then blasting. Advantage can thus be taken of any peculiarities in the breaking of the rock. If this method were tried with the heavier machines, too much time would be consumed in setting up and tearing down.

6. Small consumption of compressed air.

In the harder ground and particularly in the solid quartz the piston drill is still used for sinking on account of the large number of steel breakages (due doubtless to crystallization) and the consequent loss of holes. Some of these open pits are gradually running together, making one large open pit or "Glory Hole." No timbering is done except in shafts and chutes.

Timbering employed is very simple. Square sets are used in the shafts. Stulls and lagging are placed in the stope above the drifts and the ore is broken down onto the timber by overhand stoping. Work is carried up on the broken ore, only sufficient being drawn off below through chutes to keep the broken rock far enough away from the back to allow work to proceed.

The Hollinger mine is being opened up by levels 100 feet apart, the lowest at present being the 300-foot. The main 4-compartment shaft only goes to the 200 ft. level, but work will soon be resumed to connect it with lower levels. A winze connects the 200 foot and 300 foot levels. Underground workings, including drifts, crosscuts, shafts and winzes now aggregate over 1½ miles.

The following table will give an idea of the drilling averages in the different rocks at this mine. The drifts will average about 6 ft. x 7½ ft., and the machine used is a No. 43 Rand 3¼ inches:

Drilling Averages in Different Rocks at Dome Mine.

Rock.	Holes. No.	Holes. Depth, ft.	No. sticks.	Description.	Depth. broken ft.	Time hours. *
Quartz and schist in porphyry....	15	5	130	40 % dynamite	4.0	14
Quartz and schist in basalt	14	5	110	40 % dynamite	4.5	10
Quartz alone	19	5	160	40 % dynamite .... Some gelignite in cut	3.5	18
Schist with dip	12-14	5	90	40 % dynamite	5.0	15
Schist against dip .... Powder 1¼	15	5	115	40 % dynamite	3.75	18x

x—3 hours lost and 15 sticks of dynamite used in reblasting cut.

*—This time includes drilling, shooting and setting up.

In stoping when the ore is 20 feet wide as is frequently the case in No. 1 vein, the ore is broken down in benches by long almost flat holes, piston drills being used.

32 holes, 7 ft. deep are employed to break a block of ore 20 ft. x 10 ft. x 7 ft., using from 6 to 7 sticks of powder per hole.

At the Dome mines the ore consists of large masses of quartz and schist, frequently alternating, banded and much mixed. The presence of quartz seems to be a necessary accompaniment of the gold values, though it is rather along the small contacts of the quartz and schist that the gold occurs, than in the quartz itself. The ore is, however, so mixed that very little sorting can be done, and the whole mass is sent to the mill if the average is of milling grade. Two 3-compartment vertical shafts have been sunk, No. 1 to 100 ft. and No. 2 to 250 ft. Sinking of No. 2 shaft is to be continued. A double tracked incline 568 ft. long connects the 45 ft. and the 100 ft. levels with the surface, and the mill. From the surface to the 45 ft. level the grade is 13.55 per cent., and from the 45 ft. level to the 100 ft. level, 18.19 per cent.

The 45 ft. level was divided into 100 ft. rectangular blocks of ore by drifts and crosscuts. A number of raises were then run to the surface with a chute at the foot of each. The ore which was broken down from above in benches was drawn off through these chutes, trammed by mules to the foot of the incline and hoisted into the mill. As the ore is mined and drawn off, inverted cone-shaped excavations are formed. Fourteen

Piston drills are used underground for drifts, crosscuts and shafts; hammer drills for raises, and small pluggers and piston drills for stopes.

In drifting in the schist it requires 17 to 18 holes 6 feet deep to bring the round. The bottom cut is generally used as shown in sketch No. 1. In some of the drifts where the ground is blocky the four hole diamond cut is used to advantage. The average drilling per shift is from 8 to 9 holes.

In drilling in the quartz, the same number of holes is used, but six to seven 5-foot holes is a shift's work. The average amount of powder used per round is 150 sticks, 50 of this being gelignite used in the cut and the remainder 40 per cent. dynamite for the square up. The machine used is the Rand 3¼ inches.

In the glory hole stoping six plugger drills (Rand BC 26) are used to break ore for the mill. The average footage drilled per machine is approximately 56 feet. The powder consumption averages about 8 sticks per hole of C.L.X. Special, the holes having an average depth of 8 feet.

The total underground workings now amount to nearly 1¼ miles, without counting shafts and raises.

A 75 h.p. geared electric hoist serves the inclined shaft while a similar hoist of 250 h.p. capacity is installed at No. 2 shaft. At present, power is supplied by seven 150 h.p. Babcock & Wilcox boilers, fired with soft coal. Two 375 K.W. Allis-Chalmers generators run by 2 Robb-Corliss engines give the required electrical power for operating the mill, hoists, etc., and two 12-drill Ingersoll-Rand air compressors supply the mine with the necessary compressed air.

THE TRANSMISSION OF POWER BY COTTON ROPES

By E. EDWARD HART, M.A.

A Paper Read Before the Association of Engineers-in-Charge

(Continued from issue of June 1)

Difficulties of Rope Driving and Their Solution.

Fraying.—If ropes show signs of undue fraying, in nine cases out of ten they are rubbing on something in their flight. They may only touch the obstacle at stopping or starting time, but wood or stonework rubbing on cotton quickly wears the latter. I have seen drives where there was apparently 4 ft. of clearance when the ropes were running, yet at starting the slack side would come round and touch the wooden floor of the wheel race. If this is not the cause, it may be due to a fracture or roughness in the pulley, or the pulleys being out of line may cause the rope to rub on the flanges. Sometimes it is caused by slipping; this will soon show itself by the pulleys heating. The cures for fraying are obvious. Any slight fraying caused by ordinary wear may be alleviated by using a good anti-fraying composition.

Excessive Stretching.—The usual cause of ropes stretching too much is their getting wet. In bleach works and paper works it is often difficult to keep the ropes dry, and sometimes ropes have to work partly in the open air, and so are exposed to rain. The primary effect of a wetting is to tighten up the ropes, but after wards they continue to stretch for some time and often it is necessary to tighten up a set of ropes two or three times before the trouble due to a soaking can be eliminated. If ropes have to work out of doors, or in a damp place, it is advisable to have them specially waterproofed, as the waterproofing compound not only prevents the damp from rotting the cotton fibre, but greatly minimizes the stretch due to the action of moisture on the rope.

Hot Necks and Tightness of Ropes.—We are sometimes blamed by engineers for putting on ropes too tight, and causing hot necks; occasionally I think the blame rests, not on the rope-splicer, but on the engineer, who has either not provided long enough bearings, or who is overloading his drive. As you will have gathered from what I have said previously, when a rope has to transmit a heavy load, it must be fairly tight to prevent slipping. Sometimes this load is caused by a tightly screwed-down bearing, or a shaft out of line. The way to avoid hot necks is to be careful not to overload the ropes, and have long bearings. It is easy to put in one or two more ropes than are actually required; the ropes, then, need not be put on so tight, and will not cause such friction in the bearings.

On the other hand, we are now and then blamed for putting the ropes on too slack. The question of how tight ropes should be put on depends upon circumstances. It is best to have the ropes on at such a tension as they will just do the work without slipping, for the tighter a rope has to be the shorter its life. When new ropes are being fixed the splicer must use his own judgment as to the tension, bearing in mind the strength of the shafts and bearings. It is often cheaper to have ropes tightened after they have been running a short time, than to risk bending a weak shaft, or damaging the ropes in putting them on.

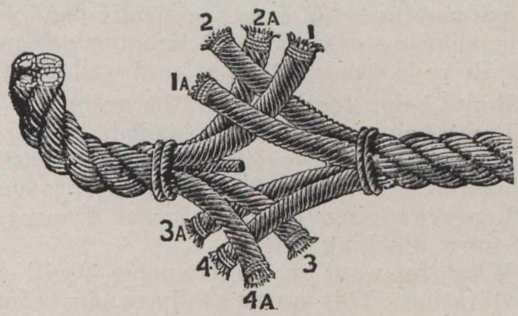


Fig. A.

Differential Driving.

It is important that all the ropes on any one drive should be of the same diameter. If the driver and driven pulleys are equal in size, then it does not much matter. But where one pulley is larger than the other, the smaller ropes sinking deeper into both grooves, attempt to give to the driven pulley a slightly different speed than the thicker ropes, and uneven driving and friction is introduced. Where, as is usual, the larger pulley is the driver, the small ropes are doing more than their fair share of the work; where the smaller pulley is the driver, practically all the work falls on the thicker ropes.

Bouncing Ropes.

Occasionally one hears of engineers who are troubled with ropes jumping off the pulleys, or the ropes when running cause them much uneasiness by their undue surging or swaying. In almost every case the cause of the trouble is due to the design or construction of the plant, and quite outside the rope-maker's province to cure, however anxious he may be to make the drive a success. The following are generally found to be the causes of ropes bouncing:

(1) Pulleys out of line with each other, although they may be true and concentric.

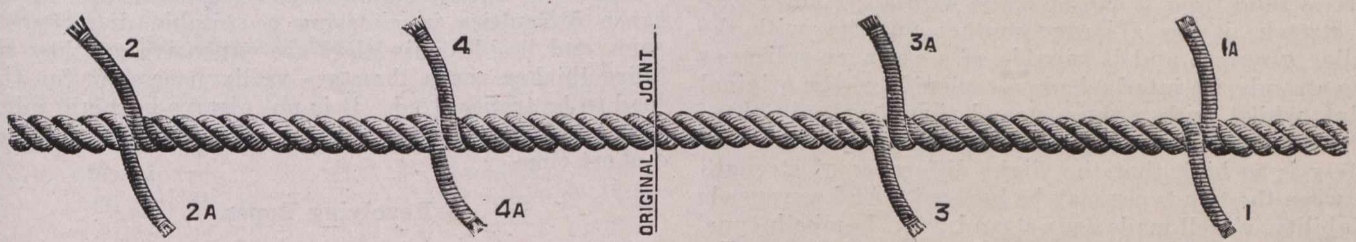


Fig. B.

(2) Pulleys out of truth.

(3) Pulleys eccentric.

(4) Pulleys not balanced.

(5) Varying speed of engine, due to bad governing or want of weight in the flywheel.

(6) Fluctuating heavy load, e.g., driving a steel rolling mill, or in the case of a steam engine and water wheel working on the same shaft, one will occasionally overrun the other.

(7) Ropes flapping against something in their flight.

(8) Bad splicing; the rope should be no thicker at the splice than in the rest of its length.

In addition to the above, there are several other conditions which, whilst they are not in themselves the sause of ropes leaving the grooves (as is sometimes erroneously supposed), yet accentuate the cause given above, viz.:

(1) Ropes being too slack. As long as they do not slip, ropes may be as slack as practically possible, without ever showing any signs of jumping off, provided that the drive is steady, straight, and well-designed.

(2) Ropes being too thick for the grooves.

(3) Ropes being very heavily loaded.

(4) Excessive speed, owing to centrifugal action the ropes have a tendency to fly out of the grooves.

(5) Ropes wedging too much in the grooves and so setting up a plucking action.

(6) What, for want of a better name, I will call harmonic vibration. This appears to have some connection with the speed and weight of the ropes, and the distance between the pulley centres, and I believe it can be cured by altering these factors. Where it is difficult or impossible to remove the causes of ropes bouncing, a wooden grid is sometimes used in order to prevent the ropes leaving the grooves. It is usually placed on the slack side of the drive, for the ropes to run through, a short distance before they reach the driven pulley.

The Best Type of Rope to Use.

In designing a driving rope, the main results a ropemaker strives to obtain are: Low rate of stretch, large surface contact with the sides of the pulley groove, pliability, strength and suitability to take a strong and easily-made splice.

Many types of both three and four-strand ropes are used for transmitting power. The advantages of a three-strand rope are that it can be made slightly more pliable, and is rather stronger than a four-strand rope. But these advantages are more than counter-balanced in the four-strand rope, because, as compared with a three-strand rope, it can be made with a far lower rate of stretch; it has a larger contact surface with the pulley grooves; and is capable of a stronger splice, as two strands are interlocked on each side of the original joint, whilst with a three-strand there are only three interlockings altogether. Besides this, the factor of safety is so high that the slight difference of strength between the two types may be ignored. And as regards pliability, a well-made four-strand rope, Lambeth type, will bend almost as well as a three-strand rope. The only drawback to the four-strand rope is that occasionally they have to be fixed in remote parts of the world where there are no expert driving-rope splicers; these places are rapidly growing fewer, but it is preferable to have a three-strand rope properly spliced, than to have a badly-spliced four-strand rope. This difficulty of getting ropes spliced properly in up-country and remote places is also being more and more evaded by having the ropes spliced endless before they leave this country; they are then ready to be slipped into the grooves of the pulleys. Though this means sometimes lifting a shaft out of its bearings, it is often by far the best plan in the end, as badly-spliced ropes never give satisfaction. When endless ropes are used, it is advisable, where possible, to have either machine or motor on a sliding bed, in order to take up any slack in the ropes.

As Regards Fibre.

Cotton has proved itself to be unquestionably the best. There is still some difference of opinion as to whether American or Egyptian cotton is the best to use; excellent results can be obtained from either, provided the quality of yarn is good. Though a little dearer to buy, Egyptian is generally preferred.

Pully Grooves.

It is impossible to read a paper on rope-driving without making some allusion to the pulley grooves in which the ropes have to work. Very much has been said and written as regards the best shape and angle of groove to use. And although there is now much more uniformity of opinion as to the best shape of groove than was at first the case, yet I think it would prove of great value to both ropemakers and rope users alike, if in future, rope grooves could be standardized. At present each engineer makes what he thinks to be a suitable size and shape for any particular size of rope. And though many are excellent, their ideas are not all alike, and it would be a valuable thing in many ways to have a definite standard to work to. As regards the angle of the groove, possibly 40 degrees is the best for a three-strand rope, and 45 degrees preferable for a four-strand rope. But the difference of a degree or two, one way or another, in the angle between the sides of a groove is a small matter compared with the importance of seeing that the bottom of the groove is narrowed sufficiently. This is to ensure that the given size of rope which has to work in it can never touch the bottom of the groove and so slip. There are engine builders to-day who are turning out grooves for which they specify 2¾-in. diameter ropes; but they make them wide enough at the top to comfortably take a rope more than 2 inches in diameter, and the bottoms of the grooves are so round that it is scarcely safe to put 1¾-inch diameter ropes in them. There is nothing to object to in making grooves reasonably wide at the top; this is often a useful feature provided the pulleys are large enough in diameter, as it enables thicker ropes to be used if more power is required. But unless the load is a light one, these round-bottomed grooves are apt to cause difficulties in choosing a suitable diameter of rope, and besides this, they are expensive, as they require thicker ropes than are really necessary for the load to be transmitted. It is not always borne in mind that all ropes reduce slightly in diameter after running a short time.

Revolving Ropes.

The question is sometimes asked, "Why do some ropes revolve in the groove, whilst others do not?" This has never been satisfactorily answered, as on many drives half the ropes revolve and the rest do not. Three-strand ropes have a tendency to wear V-shaped, because their cross-section is somewhat triangular; whilst four-strand ropes tend to wear round in shape, as their cross-section approaches more nearly to a circle. With either three or four-strand ropes, it is reasonable to suppose that by putting them on tightly, they will tend to wedge themselves somewhat in the grooves, and so be induced to wear V-shaped. The fact that ropes revolve or not has very little to do with their longevity, as it is easy to point to both types which have worked well for many years. Some people imagine that when a rope begins to revolve it is rapidly rubbing itself away; this is quite an erroneous view of things. As a matter of experience, the ropes which have the longest ilfe are, in the majority of cases, quite circular in section. And when ropes have been running for any length of time, it is always easier to tighten a round rope which has been worn evenly all over its surface, than to attempt to re-splice a rope which has worn V-shaped, and taken all the wear on its two sides only. Some engineers prefer ropes to revolve, because they affirm that there is less frictional loss whilst leaving the groove with a round rope than with a V-shaped rope

Splicing Ropes (4-Strand).

Unlay the five feet each end that has been allowed for splice, that is, as far back as the bands which mark the running length of rope; it is advisable to tie a string around the end of each of the loose strands to prevent the twist from coming out. The strands are now interlaced together, one from the right-hand side being next to one from left-hand side, and so on, as shown in Fig. A. These strands should be pulled tight so that the bands butt together, and the loose strands one one side tied temporarily around the rope to keep the two ends of the rope in the position they onw are.

Cut one of the bands, say the one on the right, and unlay strand No. 1A, at the same time laying in its place its fellow strand No. 1 from the opposite side of the rope. Do this for about four feet, and tie the two strands temporarily until all are ready for tucking

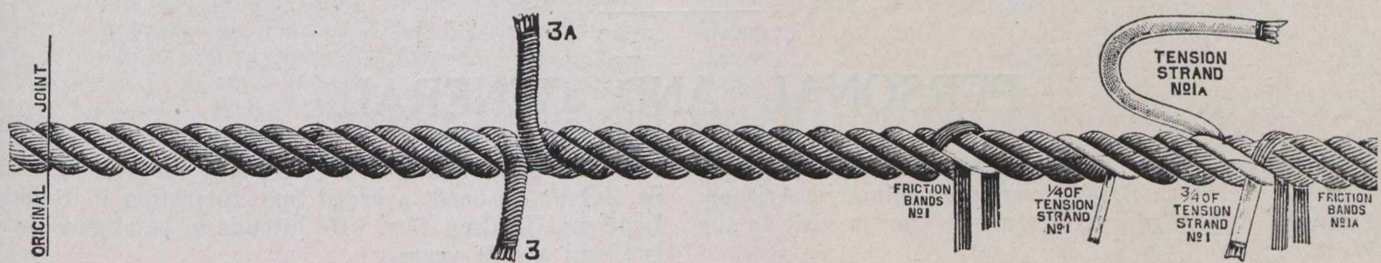


Fig C.

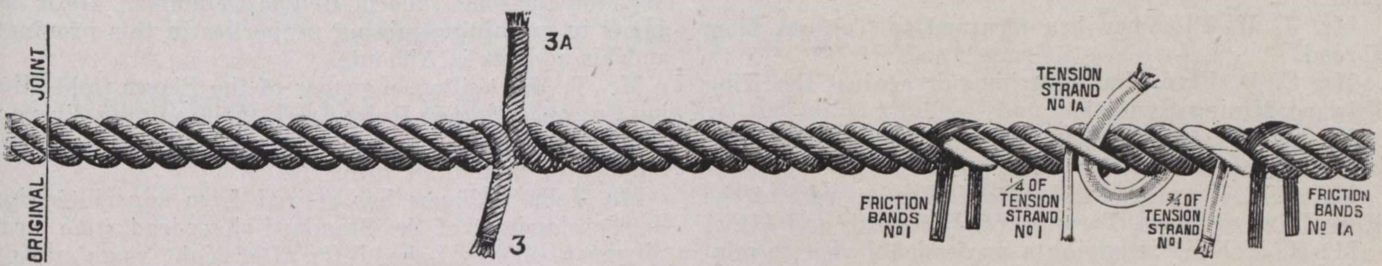


Fig. D

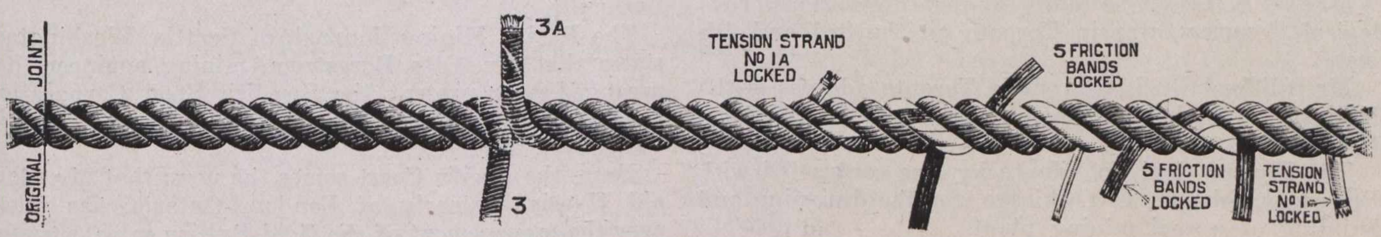


Fig. E.

maintaining that it partakes more of the nature of roiling friction.

Storing, Stretching, Etc

If it is necessary to store the ropes before fixing, they should be kept in a dry room, not on an earthen floor. When ready for fixing uncoil the ropes left-handed—the opposite to the way the hands of a clock move. Then stretch out with a pair of hand blocks, but do not allow the rope to revolve during this operation, or the "turn" or "twist" will be taken out of it. Everything depends upon the strength of shafting, etc., as to how tight the rope should be stretched, but under ordinary circumstances it is usual to have about four men pulling on a pair of hand blocks. Pass a string around the drive to get the exact running length of rope, and by tying two bands around the rope, mark off the exact running length whilst it is on the stretch, allowing ten feet (five feet each end) for the splice. For ropes 2 inches in diameter, allow 12 feet for splice.

in. The next strand to this, as will be seen in Fig. A, is numbered 2, but do not touch this now; take the next strand but one, numbered 3A, and unlay it, laying in its place strand No. 3, but only for about 1 ft. 6 in.; tie these temporarily. It is very important in splicing four-strand ropes that two strands next to each other should not be laid up in the same direction.

Next cut the other band, and proceed in the same manner with strands No. 2 and No. 4, but of course in the opposite direction. Care should be taken to keep the "turn" or "twist" in the strands, and they should be laid well and evenly down in their places. The splice should now be as Fig. B.

Begin now at joint No. 1 and IA; untie the temporary fastening and shorten the strands to equal lengths of about 1 ft. 6 in. An examination of the strands will show that the outside layer is composed of ten threads; for reference we wil lcall these the friction bands; the internal portion of the strand we will call the tension strand. Take No. 1A and remove from it the ten friction bands and divide them into two lots of five, but do not cut them off. Now take strand No. 1 and unlay it two turns or laps, and whilst it is there remove from it the ten friction bands, divide them into two lots of five, but do not cut off. Now lay in again the tension strand only of No. 1 one turn, and reduce it by leaving out about one quarter, lay up the remaining three-quarters one turn, thus bringing it up to tension strand of No. 1A; tie the two with an overhand knot. At this knot the rope should be about its original diameter, and the joint should appear as shown in Fig. C.

Take tension strand 1A and with the splicing-pin work it under and over tension strand No. 1, as shown at Fig. D, passing it under and over spirally about five times; it will then have reached friction bands No. 1. Now reduce it by cutting out a portion, and pass the remainder between the two lots of five friction bands; and lock by passing once or twice through the centre of the rope. This is clearly shown at Fig. E. Five friction bands are also locked through the rope as shown. This complete, turn to three-quarters of tension strand No. 1, this is locked exactly as tension strand No. 1A, five of the friction bands are also locked, as previously shown, and the splice should now be as Fig. E.

All loose ends are cut off, and this portion is complete. Treat the two other joints in the same way, and the splice is complete.

With a three-strand rope one strand is run to the right, another to the left, the third strand remaining with its fellow strand at the butt point; then follow the same process of tucking in as with a four-strand rope.

PERSONAL AND GENERAL

Mr. Eugene Coste is visiting in Toronto.

Dr. J. McIntosh Bell is examining mines in Arizona.

Mr. B. A. C. Craig has returned from a visit to the West.

Mr. Robt. Bryce is spending a few days at Kirkland Lake.

Mr. J. H. Plummer has returned to Toronto from abroad.

Mr. C. D. Flynn has won his suit against the King Edward Mining Syndicate.

Mr. Geo. F. McNaughton is still in Nova Scotia. He is expected in Toronto in July.

Mr. A. P. Turner and Mr. D. H. Brown were at the King Edward Hotel, Toronto, on June 10th and 11th.

Mr. J. McEvoy is paying a professional visit to mining districts in Venezuela. He will return about July 1st.

Mr. W. S. Lecky, secretary of the International Geological Congress, was in Toronto on the 3rd and 4th inst.

Mr. Clifford B. Smith, whose Toronto address is the National Club, has returned from a trip in Northern Ontario.

The Hazard Coal Co., Kentucky, has contracted with Roberts & Schaefer Co., Chicago, for the designing and building of a coal mining plant.

Mr. G. J. A. Buisson, of the Consolidated Mining and Smelting Co.'s engineering staff at Rossland, has been in the hospital in that camp for a short time.

R. H. Flaherty, head of the mine department of the C. N. Ry., recently spent two weeks in Nova Scotia in connection with certain mining investigations.

Mr. H. W. Newton, of Republic, Washington, superintendent for the North Washington Power and Reduction Co., was at Rossland and Trail, B.C., late in May.

Mr. H. E. Croasdaile, who years ago was manager for the Hall Mines Co., at Nelson, B.C., has returned to West Kootenay after having been in England for some time.

Mr. Harry Hook, formerly of Greenwood, Boundary district, British Columbia, is now at the British Columbia Copper Co.'s Napoleon mine, near Boyds, Washington, U.S.A.

Mr. A. A. Hassan has completed an examination of Boston and Goldenville Gold Mining Co. properties at Moore Hill, N.S. He is about to undertake another examination in Alaska.

Mr. R. J. Flaherty leaves shortly for Halifax and St. John's, to outfit a vessel for exploration in Baffin's Land and Hudson Bay. He intends to be absent about two and a half years.

Mr. Gwynn G. Gibbons is again in Ontario, after having been for some time in British Columbia. He is engaged in examining mining properties in this province, and his address is Almonte.

Mr. T. M. Daulton, manager of the Placer Gold Mining Co., operating on Ruby Creek, Atlin mining division, British Columbia, is this season employing a larger number of men than formerly.

Mr. John Vallance has retired from superintending the development of the Standard silver-lead mine, near Silverton, Slocan Lake, B.C., after eight years' steady work there. He has been succeeded by Mr. Ivan De Lashmutt.

The Pacific Mining Journal, of Seattle, Washington, states that Mr. Otto Bergstrom, mining engineer, has arranged to represent the Swedish Steel Corporation on this coast and has opened offices in Seattle, and in Vancouver, B.C.

From the Pacific Coast comes the news that Mr. Ronald Harris, formerly of London, Ontario, has taken over the management of the Gold Bullion mine, situated near Knik, Alaska. He left Seattle, Washington, for that property on May 5.

Mr. F. M. Sylvester, of Spokane, Washington, assistant to Mr. Jay P. Graves, vice-president and general manager for the Granby Consolidated M. S. and P. Co., is visiting that company's Hidden Creek property, near Granby Bay, Observatory Inlet, B. C.

Mr. Gomer P. Jones, general superintendent for the Hedley Gold Mining Co., operating the Nickel Plate-Sunnyside gold mine and a 40-stamp mill in Camp Hedley, Similkameen, B. C., has been spending a week or two in Victoria and other Coast cities.

A Dominion charter has been obtained by the Ontario Steel Products Co., the Canadian branch of the U. S. Steel Corporation. The capital of the company is placed at $20,000,000, the chief place of business being at Ojibway, near Sandwich, Ontario.

Mr. James Johns, superintendent for the British Columbia Copper Company at its Mother Lode copper mine, near Greenwood, will shortly leave British Columbia to take a similar position at the Dominion Nickel

Co.'s mine near Sudbury, under Mr. E. Hibbert also for several years in charge of the Mother Lode mine.

Mr. Wakely A. Williams, superintendent of the Granby Consolidated Co.'s smelting works, now spends the greater part of his time at Granby Bay, where the company is erecting and equipping a 2000-ton copper smeltery to smelt ore from its Hidden Creek mines, in that part of British Columbia.

Mr. Wm. Watson, for some time manager for the Mother Lode Sheep Creek Mining Co., operating a gold mine and stamp mill in Sheep Creek camp, Nelson, mining division, British Columbia, has returned to New York from a recent visit to Nelson. Mr. George E. Farish has been in charge at the Motherlode since last November.

Mr. Geo. Watkin Evans, of Seattle, coal mining engineer, who spent last year's field season examining coal lands in the Groundhog basin, upper Skeena district, British Columbia, has gone to Alaska on a preliminary trip to make necessary arrangements for a large expedition which is to leave Seattle on July 5 for Alaska, where, under Mr. Evans' direction, an examination of the Matanuska coalfield will be made for the United States Bureau of Mines.

The Robb Engineering Company has been completely re-organized with increased capital under the name International Engineering Works, Limited. The extensive engine and boiler plants at Amherst, N.S., having every modern facility for the work, will continue to build the full line of horizontal and vertical Corliss engines, single-valve high-speed and English type of vertical compound engines, etc.

Captain Alexander, of the mining property on Taku arm of Tagish Lake, near Atlin, formerly known as the Engineer group and later as the Northern Partnership, has returned to British Columbia from a visit to England, whence he went to endeavour to arrange for putting a comparatively large stamp mill on the property on which some unusually high-grade gold quartz has at times been found.

Mr. W. A. Cameron, superintendent of the Consolidated Mining and Smelting Co.'s Slocan, B.C., mining properties, will in future make New Denver his headquarters. Beside resuming work on the Richmond-Eureka group near Sandon, the company is developing the Ottawa mine, in Slocan City mining division, and a group of mineral claims on Four-mile creek, near Silverton, Slocan Lake.

SPECIAL CORRESPONDENCE

DOMINION COAL OUTPUTS

The Glace Bay mines produced 403,000 tons in May, slightly less than your correspondent's forecast of 405,000 tons. The production in May, 1912, was 388,340 tons. The total output for the first five months of the present year has reached 1,900,000 tons, compared with 1,733,000 tons for the same period in 1912, showing an increase in 1913 of 167,000 tons.

The shipments to St. Lawrence ports have been the heaviest yet recorded in the month of May. In the concluding week of the month the Montreal shipments reached 76,000 tons, the largest shipments in any one week. The shipments for the month for the St. Lawrence were almost 240,000 tons.

There was a good deal of absenteeism during May, or the output would have been larger. This condition is not, however, an unusual one at this time of the year.

As compared with 1912 the Dominion Coal Company mines show an increase averaging over 33,000 tons a month so far this year. When it is considered that in 1912 the outputs at the end of May showed an increase of 42,000 tons per month over 1911, the Coal Company's production must be regarded as eminently satisfactory.

Few people realize just what an increase of 75,000 tons per month in coal output actually involves. It means for one thing that at least a thousand additional workmen must be secured, and in Cape Breton, this is equivalent to saying that houses to accommodate this number of men and their families must be built by the employer. The population accompanying a working force of one thousand men would number about three thousand persons, or altogether a community of four thousand souls. The underground development of a colliery large enough to give 75,000 tons monthly would take from two to three years. All this is apart from the capital expenditure necessary to provide equipment for the mine, railway connections, water supply, and many other necessary matters. The increase in the Dominion Coal Company's outputs during the past two years is just about equal to the annual production of the Nova Scotia Steel Company's mines, and is double the entire production of any other coal company in Nova Scotia.

The Financial Post repeats a statement that has been freely copied in the press, to the effect that the Nova Scotia Steel Company expect to increase their output from 841,000 in 1912 to 1,000,000 tons in 1913. A substantial increase in the Scotia Company's output is to be expected, but that it will reach a million tons this year is hardly to be looked for, and it is not quite fair to the management of that company to make such a prophecy.

The Cape Breton Coal Iron & Railway Co., have now employed at Broughton colliery between 75 and 100 men, and it is expected that coal will be sent to the surface during June. The output from Broughton will probably be sent over the Dominion Coal Company's railway and shipped at Louisburg.

BRITISH COLUMBIA

The following Brief Review of Mining in British Columbia was made by M. E. Purcell, superintendent of the Consolidated Mining and Smelting Co.'s Centre Star-War Eagle group of mines, at the joint meeting of the Spokane Local Section of the American Institute of Mining Engineers and the Western Branch of the Canadian Mining Institute, held at Rossland, B.C., on May 22-23:

"A brief review of mining in the Province during the year shows that there has been a substantial increase in the production of the metalliferous mines. There was also a considerably larger production of coal, and this notwithstanding the fact that the output from some of the coal mines on Vancouver Island was retarded owing to disagreement between mine owners and the United Mine Workers of America.

Metalliferous Mining.

"In the Coast District—The Granby Consolidated Co. has been actively engaged in developing and equipping its new holdings near Granby Bay, Observatory Inlet.

"The Britannia Mining and Smelting Co. employs in its mining and milling operations on Britannia mountain and at Britannia Beach, Howe Sound, between 600 and 700 men. Ore is now being developed and extracted on a larger scale than at any previous time here. A modern concentration plant is being installed, and hydro electric power is being developed to provide additional power commensurate with the company's enlarged operations.

"In the Interior—The old producing mines of Boundary district, namely, those of the Granby Consolidated Co., in Phoenix amp, and the British Columbia Copper Co., near Greenwood, as indicated by the published reports of those companies, have maintained a steady, vigorous, and profitable ore-production.

"In Slocan district, the production of silver, lead, and zinc has increased over that of previous recent years. The development of bonanza ore bodies in the Standard and other mines, and recent openings of high-grade ore in other parts of the silvery Slocan promise well for a large and well-sustained output of ore for a lengthy period.

"In Ainsworth camp, there is renewed activity at the Highland and No. 1, which properties are being operated by the Consolidated Mining and Smelting Co. The Silver Hoard, also in this camp, is being energetically developed by some Spokane capitalists . Across Kootenay Lake from Ainsworth, the old Bluebell lead mine, under the capable management of S. S. Fowler, has again become a regular ore-producer.

"In Nelson district, the Silver King copper-silver mine, recently purchased by the Consolidated Mining and Smelting Co. is being placed in working condition as fast as possible, and this old-time producer is expected to soon again be on the list of shipping mines. The Molly Gibson, on Kokanee creek, another of the Consolidated Co.'s properties, the long aerial trammay from which was damaged by snowslides last winter, is now having necessary repairs made preliminary to resuming production of silver-lead ore.

"In Sheep Creek camp the Motherlode gold mine has been steadily operated all through the winter, also the Queen gold and Emerald lead mines. There has been disagreement over a wages question between the miners and the management of the Queen mine, but this is now in a fair way toward settlement.

"Rossland mines have been in continuous operation throughout the year. The total output of ore was approximately 244,000 tons, the chief shipping mines having been the Centre Star group, Le Roi, and Le Roi No. 2 group. Besides shipping 18,000 tons of crude ore, the last-mentioned concentrated some 17,000 tons and its milling operations resulted in a production of 1,658 tons of gold-copper concentrate.

"The total gross value of the ore produced from Rossland mines in all years from 1893 to date has been in excess of $55,000,000, and it is evident from present indications that there will be a regular production of ore from these mines for many years to come.

"In Hedley camp, Similkameen, too, the output has been satisfactory, the Hedley Gold Mining Co., having in 1912 produced between $700,000 and $800,000 in gold, and paid dividends totalling $360,000 for the year, or at the rate of 30 per cent. on its issued capital.

"The adoption in the province of modern methods of mining and smelting has resulted favourably, while the application of electric power to air compression, pumping, hoisting, and ore-haulage, has facilitated extensive lateral development and the exploitation of large bodies of low-grade ores such as in the earlier experiences of mining in British Columbia and with the use of mining methods then in vogue, would have been commercially impossible."

Coal Mining.

The production of coal has assumed comparatively large proportions in the province. Preliminary returns show that there was last year a gross output of 3,066,000 long tons against 2,298,000 tons in 1911, this giving an increase of 768,000 tons. The quantity of coke made was about 265,000 long tons, the whole of which was from coal mined in the Crow's Nest district, in southeastern British Columbia.

General.

The net profits of metalliferous mining companies operating in British Columbia in 1912 were not less than $3,000,000.

The aggregate value of mineral production of British Columbia for all years to the end of 1912 has been approximately $430,303,000. The greater progress of recent years may be better recognized if some comparisons be made. The provincial mineralogist, in his preliminary report, for 1912, gave the following figures: The aggregate value of all minerals produced in 51 years 1852-1902, was $189,729,000; in ten years, 1903-1912, it was about $240,574,000. These figures show that nearly 57 per cent. of the aggregate production of 61 years was made in the ten years last past, leaving but little more than 43 per cent. for the 51 years that went before. It is, therefore plainly evident that there has been progress of a very substantial character during the last decade. Bringing the comparison nearer to the present time it may be further shown that the proportion of the last five-year period, 1908-1912, was $130,776,000, as against $109,798,000 for the corresponding period, 1903-1907. It is a striking fact that of the value of the mineral production for the whole period of 61 years for which statistics are available, more than 30 per cent., or nearly one-third, was the production of the last five years. This is surely convincing evidence of the substantial and gratifying progress that is being made by the mining industry of British Columbia.

Rossland's Production Figures.

From a number of the Rossland Miner published while the meeting of the local sections of the two institutes was being held, it is learned that the aggregate production of the mines of Trail Creek mining division, practically all from Rossland camp mines, during the 19 years over which production from these mines has been spread, has been 4,104,228 tons of ore, containing 2,018,152 oz. gold, 3,383,951 oz. silver, and 86,838,170 lb. copper, together having a gross value of $55,577,452. The revised figures for the year 1912 were as follows: Ore produced 243,870 tons, containing 132,073 oz. gold; 87,530 oz. silver, and 2,539,900 lbs. copper, together having a gross value of $3,196,037. The average gross value of the production of the last five years has been more than $3,000,000 a year. It is noteworthy, too, that of the aggregate production of lode gold in the whole of British Columbia in all years, 3,438,849 oz., about 59 per cent. came from Rossland mines. It is of interest, also, as bearing out the truth of last year's reports of an increase in the gold value of the ore mined, that while the average gold content of 1,333,531 tons of ore mined in five years, 1907-1911, was 0.441 oz. per ton, that mined in 1912 averaged within a small fraction of 0.540 oz. per ton, and this notwithstanding that in one important mine there was a marked decrease in the gold content of the ore mined last year. There is believed to be good reason to look for a rather higher average gold content in the ore being mined in 1913.

COBALT, ELK LAKE AND GOWGANDA

Union Decides Not to Call a Strike.—The uncertainty which has held back development in the Cobalt camp all spring was dispelled when the Cobalt branch of the Western Federation of Miners decided not to strike. There has been unrest among the union men ever since the strike was declared in Porcupine by reasons of the fact that several agitators who had brought on the industrial disturbance in the gold camp had bivouacked in Cobalt in order to attempt to get them out in sympathy.

Twice before the actual vote was taken the agitators had attempted to bring it to ballot, but the bulk of the men would not even allow it to go that far. Finally on May 25th it was decided to settle the matter once and for all on June 7th.

At a meeting crowded by all classes of people in the camp it was announced on June 2nd that the strike vote had failed of the two-thirds majority necessary under the constitution of the Western Federation to call a strike. The figures given out by the union were Shall we come out on strike immediately, yeas 455, nays 390; shall we proceed under the Lemieux Act, yeas 89, nays 390. It is generally believed in camp that the vote against a strike was much more decisive than the union admitted. There is general relief felt in the silver camp as it is now fairly sure that there will be no more fear of industrial disturbance for a year. It was generally thought that if the strike had been declared in Cobalt, the whole of the unions in the North Country would have been out within a week.

The union in Cobalt, number something under a thousand members, while there are between 3,500 and 3,600 men actually working at the mines. The proportion of non-union to union men is, therefore, a more than three to one.

Hudson Bay Mine.—The production for the Hudson Bay mine for the month was 51,249 ounces, about half of which was mill ore. The ore concentrated at the mill during the month amounted to 103,860 tons. The mill heads during the month ran 26.10 ounces from the wide stopes on the two main levels. The average extraction during the same period was 86.40 per cent. The average duty per stamp was 3.78 tons. The Hudson Bay is stoping between 12 and 14 feet wide on an average.

Preparations for Draining Kerr Lake. — The barge upon which the big pumps will be stationed to be used in the draining of Kerr Lake is now being built. Some idea of the magnitude of the undertaking may be seen by the fact that it is estimated that Kerr Lake now contains approximately 400,000,000 gallons of water and that it will take the 3,000 gallon pumps three months at least to lower the water so that prospecting and mining is safe at or near the surface. All arrangements will be completed by August 1st, when the actual pumping will commence.

The Miller Lake-O'Brien Mining Company owned exclusively by Mr. M. J. O'Brien is now operating the old Millerett mill at Gowganda. In a short time the old workings of the Millerett will be opened up again. The Millerett was the first producer of the Gowganda camp and still holds the high record for tonnage of the Montreal River camp. After it had been shut down for some time it was purchased by the Miller-Lake O'Brien Mining Company. The first run made in the little mill was customs from the Mann mine at Gowganda. The mill is now running continuously on Miller-Lake O'Brien ore. In prospecting recently on the Miller-Lake O'Brien in the old stope on the 90-foot level some veins were found in the wall that had been overlooked before, and a good production is now being obtained from this source. The cross vein on the 250 foot level has been followed 400 feet with almost continuous good ore, the face looking good at present. This is almost all high grade ore. Little development has been attempted on the 350-foot level, but what has been done lends the belief that the ore will be of much the same character as at the upper levels. The shaft is now being finished to the 300 foot level which will give much better facilities for hoisting ore. On the 300 foot level both the main and cross veins systems are being worked in good ore.

The King Edward Mining Company has resumed possession of the little ten stamp King Edward mill and will treat York Ontario ore on a customs basis. The mill has been leased to the City of Cobalt for the past two years. The York Ontario is the company which is working the old King Edward mine under option. One shipment of hand picked ore has already been made by this company.

The Silver Cliff Mill is now again running after being idle for more than a year and a half. It is now treating between 50 and 60 tons daily. It is stated by the company that this amount will be gradually increased until the capacity, 65 tons per day, is reached. There are some 3,000 tons of milling ore broken in the stopes ready for treatment and the bins are full. More tables have been ordered for the mill.

The Silver Bar has now about six tons of high grade ore sacked and ready for shipment. This has all been taken from stoping and development below the 50-foot level. This ore shoot has now been developed for 30 feet and the ore is still good in one face. The vein runs from one to six inches of the average high grade of the Cobalt camp. The vein is still good in the bottom of the stope below the 50-foot level. The development in ore is all in the Keewatin formation not many feet below the contact with the conglomerate. The Silver Bar was sold to the Preston East Dome by the original Silver Bar syndicate, it having reverted to them from the company.

The mill report of Buffalo Mines for the month shows that the production was considerably higher although the silver shipped previously but paid for last month was lower, mill ran 206 hours, ore milled 5,249 tons, average assay per ton before milling 45.29 ozs., ounces of silver recovered 205,139 ounces of silver paid for during the month but shipped previously 80,929.

The Seneca-Superior Silver Mines has declared another dividend of 10 cents a share, payable on June 15th. The Seneca-Superior silver mines have now paid 30 per cent. on a capitalization issued of $475,384 or $142,915. The first dividend was paid on Feb. 15th. As the Worth vein was not discovered until the end of October of last year, pervious to which not an ounce of silver was in sight, this is a remarkable record.

The May production of the Cobalt Townsite was 203,-500 ounces.

The May production of the Casey Cobalt was 101,-460 ounces. These are both high records for the two English companies.

A big pyrrhotite deposit has been uncovered in Maisonville township which is some way north of the Kirkland Lake area. The claims upon which the body has been discovered are three miles north-east of Sesikinika which is at mileage 175 on the Temiskaming and Northern Ontario Railway. The deposit is at least sixty feet wide and its length has not yet been determined though it is undoubtedly considerable. On the surface the ore does not run high in nickel though no conclusive assays have been made yet. A twenty-foot shaft is now being put down.

Idle Striking Miners Leave Porcupine.—As an aftermath of the refusal of the Cobalt miners to come out on strike there seems to be a disposition in the gold camp at Porcupine to allow the strike to go by default. A vote has been taken recently to call the strike off, but it was voted down at the union meeting. But apparently the word has been passed to leave the camp for the union men who have been idle since the strike started are leaving the camp in dozens for other parts of the Northern Ontario mining field. The strike will probably die of inanition as it did at Cobalt in 1907.

Discovery at the Teck Hughes Property.—A good discovery has been made on the Teck Hughes property at Kirkland Lake. A vein running parallel to the main vein has been stripped for fifty feet in the conglomerate. It shows considerable gold for a width of from six to ten inches in a well defined vein. It is about 200 feet north of the vein upon which the shaft has been sunk. The compressor and boiler has now been hauled into the Hughes and work has been resumed in the shaft. Another diamond drill is now running on the Schumacher property. The first hole put down on this property gave cores showing gold at 400 and 800 feet. Work with the diamond drill on the Moneta has now ceased.

The five-stamp mill at the Three Nations mine is now practically completed and the first run of ore should be made soon. The Three Nations is a French company of Montreal.

Two diamond drills are being operated on the Foley-O'Brien property which is under option to the Homestake Mining Company, of Buffalo. About a thousand feet of drilling has been contracted for.

The power conditions in the Porcupine camp are again normal. Both the Sandy Falls and Waiwaiten Falls plants are running one unit which is enough to supply the regular customers of the Northern Canada Company though by no means adequate for the needs of the camp.

The Hunton claims at Kirkland Lake have been sold to a Toronto syndicate for, it is stated, $150,000. The purchasers are Mr. Arthur Penman, Mr. Burr Cartwright and his associates. Work will be commenced at once and every effort will be made to push development.

First Gold Bars from Lucky Cross Mill.—The first clean up as the result of the first month's run at the Lucky Cross mine of Swastika resulted in the production of a gold brick worth between $5,000 and $6,000. There are but five stamps dropping in the plant at present, but five more are to be added as rapidly as they can be rushed in and installed.

In stoping ore for the five-stamp mill at the Swastika mine a little better grade has recently been encountered. The mill is now making a fair profit. The company is short of funds and is seeking to obtain more by the raising of the capitalization from $2,000,-000 to $3,000,000.

The Ontario Government has commenced the wagon road from Swastika to Kirkland Lake with the most commendable promptitude. One hundred and fifty men are already grading and blowing out stumps and this force will be doubled as soon as the men can be obtained. The route will closely follow the present road. A survey has been made for a spur line, but it is most unlikely that it will be built for some time.

SPRAYERS OR DUST ALLAYERS USED IN COBALT MINES

In his report to the T. & N. O. Railway Commission on Mining in Northern Ontario, Mr. A. A. Cole has the following paragraphs on the subject of sprayers:

Miners' phthisis has recently been classed by a South African Commission as an industrial disease, and subject to compensation as such. No class of mine labor is exempt from it, but machine drillers are most subject to this disease.

Recent attempts to overcome this dust difficulty are of general interest to all branches of the mining industry. During 1912 a clause was inserted in the Mining Act of Ontario, under which the mine inspector has power to insist on means being adopted to keep down the dust. The clause is section 164, subsection 60:

"Every dust place where work is being carried on in a mine shall be adequately supplied at all times with clean water under pressure or other approved appliances for laying the dust caused by drilling or blasting operations."

Both piston and hammer drills are used in the mines of Northern Ontario, but the hammer drills are the greater offenders as dust makers and spreaders. A number of different makes of hammer drills are now operating in the mines at Cobalt and Porcupine, the principal ones being the Rand, Sullivan, and Waugh. For each of these machines a sprayer or dust allayer has been introduced, and already working conditions have been improved. Although these innovations are introduced primarily for the benefit of the employee, and the employer only benefits indirectly by the increased efficiency of the labor employed, the principal difficulty in their adoption lies with the employee. This is another case of the common experience where companies find it extremely difficult to make their miners observe even the more simple necessary precautions. In all kinds of work men willingly court known and certain hazards rather than take a little trouble to guard against them. The objection to the sprayer seems to be that the drillers are put to the extra trouble of providing buckets of water at intervals.

The sprayers are all designed on the injector principle. Each drill company has a sprayer attachable to its own make of machine. They are light, weighing only 3 to 3½ lbs. A small amount of live air is drawn off from the air supply in the drill, and this, passing through the sprayer, draws up water through a short length of hose from a pail or other convenient source, and projects it in the form of a finely disseminated spray or mist against the collar of the hole. It is only the very finest dust which jeopardizes the health of the miners, so only the minutest particles of dust need wetting down, the larger cuttings falling to the floor of their own weight. Water can be sucked up six or eight feet from a pail or bucket, no tank or pressure line being necessary. The amount of water used will run from one to two buckets per shift, and the air consumption of the device is small enough to be practically negligible.

Not only is the freedom from dust of great benefit to the miners themselves, but it is found that the grit does not penetrate the machine and wear it out as rapidly as formerly. It is also claimed that the dissemination of this spray into the air of the mine has a beneficial effect in assisting to clear the air of powder gas.

In very cold weather in cold parts of the mine it is difficult to use this dust-lying attachment without having it freeze up.

COMPANY NOTES

Cobalt Townsite Silver.

Returns for five weeks ended 3rd May: "Production of high grade ore, 104¾ tons; production of concentrates, 72¼ tons; total, 177 tons. Total estimated value, £23,727; total estimated expenses, £8,296. Profit at mine, £15,431. Drifting, 168 ft.; cross-cutting, 392 ft.; shaft sinking, 30 ft.; raises, 45 ft. Total footage, 635 ft."

Tyee Copper.

The directors state: At the annual general meeting, held in December last, the shareholders were informed that negotiations of an important nature were being carried on. Unavoidable delays have taken place, but the directors now have pleasure in intimating that these negotiations have matured satisfactorily, and a contract has been entered into under which all the ores of the Ptarmigan Mines, Ltd. (whose mines are situated on Vancouver Island), will be treated at the company's smelter, on terms which the directors consider favourable to the company. The company will also undertake Customs ore smelting. Mr. Watson, who has been in this country conferring with the directors, will return to British Columbia shortly, and take charge of the smelter. The directors look forward to a successful operation of the plant, with a good outlook for the future.

Alaska Mexican Gold Mining.

The report of the Alaska Mexican Gold Mining Company for 1912 states that the ore reserves amounted at 31st December last to 1,040,600 tons. (Office note: The ore above the 1,570 ft. level is not sufficiently developed to estimate. The estimate, as usual, includes ore that must remain in the mine in the shape of pillars. Tons are of 2,000 lbs.) The Mexican stamp mill crushed 233,299 tons of ore, and, in addition to the free gold, saved 4,956.06 tons of concentrate. Steam was used for power 147 days, and water 213 days. During the period noted above 1 lb. of chrome steel in the shoes crushed 2.59 tons of ore, and 1 lb. of iron in the dies (which are made by the Treadwell Foundry) crushed 5.43 tons of ore. The cost of milling the above ore was $53,943.18, or $0.2312 per ton. The ore yielded in free gold, including base bars, $307,951, or $1.32 per ton, and from 4,956.06 tons of concentrate treated $371,169, or $1.5909 per ton of ore milled, making the total returns for the year $679,120.93, or $2.9109 per ton of ore milled. The cyanide plant, which is owned jointly by the Alaska Treadwell Gold Mining Company, the Alaska Mexican Gold Mining Company and the Alaska United Gold Mining Company, was built to treat the concentrate made in their various mills, and has proved an unqualified success. It has operated continuously throughout the year and treated 33,185.34 tons of concentrate at an operating cost of $3.128 per ton with an extraction of 97 per cent. In addition to the above, various additions and alterations were made to the plant at a total cost of $19,984 or $0.60 per ton of concentrate treated. The principal items of the above construction charges consisted of the installation of a blast furnace and acid treatment unit in the refining room and the installation of additional filter and precipitation presses in the mill.

Dominion Steel Corporation.

The manufacturing profits of the Corporation for the year before deducting the usual mounts for interest, sinking funds and depreciation were $4,714,057 and the net earnings $2,372,667. The latter, with the balance at April 1, 1912, totals $3,157,613.

After the payment of common and preferred dividends are provided for, the balance carried forward to this year is $883,012.

The profit and loss account for the year ended March 31 follows:

Net earnings after deducting all manufacturing, selling and administrative expenses, but before charging provision for sinking funds and depreciation and interest, $4,714,057; deduct provision for sinking funds' exhaustion and minerals, and depreciation, $1,009,650; total, $3,704,407; deduct also interest on bonds and loans, $1,246,951; proportion of discount on bonds sold $84,788; total, $1,331,739; net earnings, $2,372,667; add balance at April 1, 1912, $784,945; less dividends on preference shares, $437,500; on preferred stocks of constituent companies, $560,000; on common stock, $1,277,101; total $2,274,601; balance March 31, 1913, $883,012; total assets are placed at $80,285,438, of which $7,860,125 are current and working assets.

The total surplus of the several constituent companies at date of acquisition in excess of premiums paid on purchase of stocks thereof is placed at $1,555,418.18, which, with the profit and loss balance of $883,012.55, gives a total of $2,438,430.73.

Current liabilities are placed at $6,908,396, reserves at $527,862, while the total capital stock is $46,896,200.

Seneca-Superior.

A third dividend of 10 per cent. was declared yesterday by the Seneca-Superior Mining Company, payable June 15 to shareholders of record June 10. While dividends have been declared every two months since the first payment made in February, there is no specific period for them. The present distribution will bring the amount paid in dividends by this latest of the paying Cobalt mines to nearly $150,000. Ore was first struck only last October.

International Nickel Co.

The International Nickel Co. has issued its report for the year ended March 31, 1913. The consolidated income account compares as follows:

	1913.	1912.
Earnings of cons. cos.	$6,802,886	$5,019,703
Other income	126,220	69,263
Total income	6,929,107	5,088,966
Exp. tax, etc.	542,308	222,553
Net income	6,386,799	4,866,413
Int. deprec., etc.	1,366,494	1,284,453
Surplus	5,020,305	3,581,960
Pfd. dividends	534,755	534,749
Balance for com.	*4,485,550	3,047,211
Com. divs.	3,491,049	2,143,412
Surplus.	994,501	903,799

*Equal to 11.79 per cent. earned on $38,031,500 common stock.

At the stockholders' annual meeting of the International Nickel Co. the number of directors was increased from 12 to 15. Three new directors are Seward Prosser, W. A. Bostwick, and James L. Ashley. Other directors were re-elected.

The general balance sheet of the International Nickel Co. and its constituent companies in America as of March 31, 1912, compares as follows:

Assets.

	1913.	1912.
Prop. acct. and cons. cos.	$44,485,044	$26,197,764
Adv. Nickel Corp., Ltd.	3,999	175,571
Adv. to Soc. Min. Cal.	....	11,110
Defer charges	255,033	23,277
Stocks and bonds sundry cos.	65,430	19,710
Inventories.	3,364,969	3,263,108
Accountts rec.	1,485,941	1,345,733
Bills rec.	......	50,000
Adv. for int. ins. tax	37,627	49,915
Cash.	4,442,664	3,854,177
Total.	54,140,707	34,999,355

Liabilities.

Common stock	$38,031,500	$11,582,626
Preferred stock	8,912,600	8,912,626
Miscellaneous funds	....	41,079
Bonds.	....	8,162,154
Accts. pay. and pay rolls	752,874	744,798
Accrued taxes	102,652	76,378
Common dividend due June	1,140,945	810,767
Accrued int., unpaid cou., etc.	5,434	226,146
Pfd. div. due May	133,689	133,687
P. & L. surplus	4,921,409	3,938,093
Total.	54,140,707	34,999,355

President A. Monell says: "During the fiscal year just closed the business of the company has shown a substantial and satisfactory growth. The improved conditions in the steel industry resulted in a greatly increased demand for nickel from the steel makers, and in all other industries where the company's products are used the demand has been the best in the history of the company. All indications point to a very satisfactory business for the coming year.

"During the year the business in Monel metal in its various forms continued the development and expansion noted last year, and this metal may now be said to have established itself in certain lines in an assured position.

"We are continuing our policy of keeping our plant up to date in every respect, of increasing its efficiency wherever possible, and of enlarging its capacity."

STATISTICS AND RETURNS

COBALT SHIPMENTS.

Twelve cars of ore were shipped on June 7 from the Cobalt camp, eleven of silver and one from Campbell and Deyell's of gold from the Foster Tough property. The Trethewey and the Nipissing alone shipped ore of low grade value.

The ore shipments in pounds for the past week are:

Mine.	High.	Low.	Pounds.
Cobalt Townsite	1	..	87,405
City of Cobalt	1	..	75,400
Coniagas.	2	..	142,649
Buffalo.	1	..	66,360
Trethewey.	..	1	47,914
Hudson Bay	1	..	82,591
O'Brien.	1	..	64,112
McKinley-Darragh	1	..	61,229
Nipissing.	..	1	77,520
Cobalt Lake	1	..	64,410
Beaver.	1	..	54,373
	10	2	823,963

The shipments from the Cobalt mines to date are:

Mine.	High.	Low.	Tons.
Coniagas.	25	..	832.41
Trethewey.	5	6	301.72
Nipissing.	2	28	931.13
Dominion Red	9	..	318.66
Hudson Bay	9	..	304.17
Cobalt Townsite	27	..	982.07
McKinley-Darragh	30	..	1,049.03
Kerr Lake	9	..	325.28
Beaver.	7	..	194.41
La Rose	29	1	1,200.90
Peterson Lake (Seneca-Superior)	4	3	250.76
Temiskaming.	9	1	309.17
Crown Reserve	6	..	269.95

Chambers-Ferland	1	4	159.20
Colonial	1	..	21.56
Cobalt Lake	12	..	422.44
Penn Canadian	2	..	57.51
Drummond	11	..	300.00
General Mines	..	1	8.80
O'Brien	6	..	221.26
Silver Queen	..	1	60.34
Bailey	4	1	202.15
Casey Cobalt	3	..	109.72
Right of Way	1	1	62.19
City of Cobalt	4	..	147.20
Silver Bar	..	1	20.00
York Ontario	1	..	20.00
Buffalo	2	..	66.13
	219	48	9,148.16

The bullion shipments to date are:

Mine.	Ounces.	Value.
Nipissing	2,367,017.84	$1,383.372.97
Penn Canadian	4,363.60	2,700.00
C. and Deyell	4,169.00	2,501.40
Buffalo	605,145.90	394,308.76
Crown Reserve	156,491.00	101,054.00
Dominion Red	206,284.40	117,410.55
Townsite	10,909.00	6,647.00
Miscel.	3,920.00	1,623.00
Temiskaming	9,469.20	5,443.72
O'Brien	66,201.77	32,713.95
Wettlaufer	4.715.00	2,925.00
Miller Lake	1,734.20	970.15
Colonial	635.00	374.00
Trethewey	5,007.00	3,223.00
Casey Cobalt	2,394.00	1,520.00
Kerr Lake	10,886.98	7,046.11
Bailey	1,839.00	1,103.40
Wettlaufer	4.391.00	2 634.60
City of Cobalt	1,755.45	1,053.00
	6,037,396.14	$4,621,629.31

BRITISH COLUMBIA ORE SHIPMENTS.

Consolidated Co.'s Receipts.

Trail, B.C.

	Week.	Year.
Le Roi No. 2	202	9,080
Le Roi	381	24,780
Centre Star	2.453	60.335
Sullivan	598	15,996
Queen	38	248
California	21	21
Richmond-Eureka	34	320
Standard	226	6,283
Rambler-Cariboo	189	1,403
Knob Hill	40	1,172
Ben Hur	197	5,068
United Copper	97	1,830
No. 7.	47	3,153
Hope	84	194
Other mines	.....	13,383
Total	4,607	143,266

Granby Smelter Receipts.

Grand Forks, B.C.

Granby	23,387	520,119

B. C. Copper Co.'s Receipts.

Greenwood, B.C.

Mother Lode	4,820	141,718
Rawhide	4,226	109,312
Napoleon	173	15,290
Queen Victoria	479	11,570
Unnamed	212	2,757
Total	9,910	280,647

Nelson.

Queen Victoria	479	11,570
Queen, milled	350	5,075
Second Relief, milled	200	3,800
Mother Lode, milled	500	11,000
Queen	38	248
California	21	21
Other mines	.....	7,546
Total	1,588	39,260

Rossland.

Le Roi No. 2	202	9,080
Le Roi No. 2, milled	350	7,700
Inland Empire, milled	275	275
Centre Star	2,453	60,335
Le Roi	381	24,780
Other mines	.....	199
Total	3,661	102,369

East Kootenay.

Sullivan	598	15,996
Other mines	.....	626
Total	598	16,622

Slocan and Ainsworth.

Standard, milled	500	11,000
Van-Roi, milled	725	14,158
Bluebell, milled	1,200	26,200
Rambler-Cariboo, milled	300	6,600
Richmond-Eureka	34	320
Standard	226	6,283
Rambler-Cariboo	189	1,403
Other mines	.....	7,719
Total	3,174	73,683

Boundary.

Granby	23,387	520,119
Mother Lode	4,820	141,718
Rawhide	4,226	109,312
Napoleon	173	15,290
Unnamed	212	2,757
Knob Hill	40	1,172
Nickle Plate, milled	1,500	33,000
Ben Hur	197	5,088
United Copper	97	1,830
No. 7	47	3,153
Hope	84	194
Other mines	.....	3,225
Total	34,783	836,838

Lardeau.

Other mines	.....	233

According to a special despatch from Trenton, N. S., to the Herald, Nova Scotia Steel and Coal, Ltd., outputs for May were: Coal, 73,450 tons; pig iron, 7,954 tons; steel ingots, 5,855 tons; ore, 37,804; made on finishing mills, 6,665 tons. This is a record.

STOCK MARKETS

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg.)

June 9th, 1913.

New York Curb.

	Bid.	Ask.
British Copper	$2.12½	2.37½
Braden Copper	6.37½	6.50
Chino Copper	33.75	34.00
Giroux Copper	1.62½	1.87½
Goldfield Cons.	1.62½	1.75
Greene Can.	5.75	6.00
Inspiration Copper	14.75	16.25
Miami Copper	21.00	21.50
Nevada Cons. Copper	14.75	14.87½
Ray Cons. Copper	16.87½	17.00
Standard Oil of N. J.	348.00	350.00
Standard Oil of N. Y.	685.00	690.00
Standard Oil Old Stock	1050.00	....
Standard Oil Subs.	780.00	....
Tonopah Mining	5.00	5.12½
Tonopah Belmont	6.18¾	6.31¼
Yukon Gold	2.37½	2.50

Cobalt Stocks.

	Bid.	Ask.
Bailey	.08⅛	.08½
Beaver Cons.	.32	.32½
Buffalo	2.10	2.40
Canadian G. & S.	.21	.25
Chambers-Ferland	.20½	.21
City of Cobalt	.50	.51
Cobalt Lake	.66	.70
Coniagas	7.45	7.65
Crown Reserve	3.45	3.55
Foster	.08	.09
Gifford	.06	.07
Gould	.02½	.03
Great Northern	.15½	.16
Hargraves	.05	.06
Hudson Bay	68.00	75.00
Kerr Lake	3.00	3.15
La Rose	2.20	2.25
McKinley-Darragh	1.73	1.80
Nipissing	8.35	8.60
Peterson Lake	.21½	.22
Rochester	.02½	.04
Right of Way	.05	.06½
Silver Leaf	.02¾	.03½
Silver Queen	.04	.05
Temiskaming	.34	.35
Trethewey	.35	.36
Wettlaufer	.11	.12

Porcupine Stocks.

	Bid.	Ask.
Apex	.01½	.02
Dome Extension	.08½	.08¾
Dome Lake	1.75	1.80
Foley O'Brien	.26½	.27
Hollinger	14.85	15.25
Jupiter	.37	.39
McIntyre	3.00	3.25
Moneta	.04	.06
North Dome	.40	.50
Northern Exp.	1.00	1.50
Pearl Lake	.40	.42
Porcupine Gold	.10¼	.10½
Imperial	.02½	.03
Preston East Dome	.03½	.04
Rea Mines	.15	.30
Swastika	.04	.05
West Dome	.10	.20

Sundry.

	Bid.	Ask.
American Marconi	3.62½	3.87½
Canadian Marconi	2.00	3.00
Cochrane	1.35	1.50

TORONTO MARKETS.

June 9th—(Quotations from Canada Metal Co., Toronto)—
- Spelter, 6¼ cents per pound.
- Lead, 5¼ cents per pound.
- Tin, 50 cents per pound.
- Antimony, 10 cents per pound.
- Copper, casting, 16 cents per pound.
- Electrolytic, 16 cents per pound.
- Ingot brass, 11 to 15 cents per pound.

June 9th—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto.)—
- Summerlee No. 1, $26.00 (f.o.b. Toronto).
- Summerlee No. 2, $25.00 (f.o.b. Toronto).
- Midland No. 1, $20.00 to $20.50 (f.o.b. Toronto).
- Midland No. 2, $20.00 to $20.50 (f.o.b. Toronto).

June 9th—(Quotations from Elias Rogers Co., Ltd., Toronto)—
- Coal, anthracite, $7.50 per ton.
- Coal, bituminous, $5.25 per ton for 1¼-inch lump.

GENERAL MARKETS.

Coke.

June 6th—Connellsville coke (f.o.b. ovens).
- Furnace coke, prompt, $2.15 to $2.25 per ton.
- Foundry coke, $2.85 to $3.25 per ton.

June 6th—Tin, straits, 46.25 cents.
- Copper, Prime Lake, 15.25 to 15.37½ cents.
- Electrolytic copper, 15.00 to 15.10 cents.
- Copper wire, 16.25 cents.
- Lead, 4.35 to 4.40 cents.
- Spelter, 5.25 to 5.35 cents.
- Sheet zinc (f.o.b. smelter), 7.50 cents.
- Antimony, Cookson's, 8.65 to 8.70 cents.
- Aluminium, 25.37½ to 25.75 cents.
- Nickel, 40.00 to 45.00 cents.
- Platinum, ordinary, $46.00 per ounce.
- Platinum, hard, $51.00 per ounce.
- Bismuth, $1.75 to $2.00 per pound.
- Quicksilver, $40.00 per 75-lb. flask.

SILVER PRICES.

	New York. Cents.	London. Pence.
May 22	60	27 11/16
May 23	59⅞	27 9/16
May 24	60¼	27 13/16
May 26	60¼	27 13/16
May 27	60	27 11/16
May 28	60⅛	27¾
May 29	60	27 11/16
May 30	..	27⅝
May 31	59⅞	27⅝
June 2	60	27 11/16
June 3	59⅞	27⅝
June 4	60⅛	27 11/16