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CIRCULATION.

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MINING ACCIDENTS IN ONTARIO

The recently issued report by Mr. T. F. Sutherland, Chief Inspector of Mines, on Mining Accidents in Ontario in 1913, shows that very unsatisfactory conditions exist. The number of fatalities is unreasonably large, and it is evidently necessary that much greater attention must be given to the problem of preventing accidents. Every mine manager takes precautions to ensure safety; but the record shows that additional precautions are necessary. Most miners observe the regulations which are made to ensure safety; but the record shows that many of them do not.

During 1913 there were 64 fatal mining accidents in Ontario. Forty-five of these occurred in mines, 11 in metallurgical works, and 8 in quarries. Mr. T. W. Gibson points out that isolated or spasmodic work in the early stages of mining development, where the system and discipline attaching to well equipped and full-scale operations are wanting, carries a proportionately higher accident rate.

Mr. Sutherland states that the total number of serious accidents in and about the mines of Ontario reported to the Bureau of Mines in 1913, was 353, resulting in 45 persons killed and 320 injured; of these accidents 284 occurred underground, and 69 above. The fatal accidents took place in mines operated by 19 different companies, the same number as in 1912. At metallurgical works there were 212 accidents which caused the death of 11 and serious injuries to 201 men. At quarries there were 18 accidents which caused the death of 8, and serious injuries to 12 men.

Commenting on the year's record, Mr. Sutherland says: "While it is to be hoped that the number of deaths from accidents is abnormal for the year 1913, yet it will be seen that a large number are the result of want of proper care on the part of the workmen and those in charge, and also a lack of proper appreciation of the risks inherent to the nature of the industry. Sixty-five per cent. of the fatal accidents during the year could have been avoided by the exercise of greater caution on the part of the workmen, and by the mine operators insisting on a strict enforcement of the Mining Act. There are several mines in Cobalt which have a good record, especially during the past two years. These mines must necessarily employ the same class of labor as adjoining properties, yet their accident rate is much lower than the average of the camp.

"An example of what can be accomplished in accident prevention by intelligent effort is furnished by the Canadian Copper Company, at Copper Cliff. Mr. E. T. Corkill, formerly Chief Inspector of Mines for the Province of Ontario, was appointed Safety Engineer for this com-

pany on July 1st, 1913. The accident lists published in this report show that for the first six months of 1913, this company had 11 men killed; for the last six months, 3. Of serious accidents which incapacitated the workmen for over five weeks, the first six months shows 40 men, and the last six months, 17. A corresponding decrease is noticed in the minor accidents.

"To decrease the accidents requires as honest an effort as to decrease the costs, or to increase the production. To issue general rules without seeing that these rules are observed may be a protection in damage suits, but will not diminish the number of accidents."

It is clear that many of the accidents might have been prevented. If conditions are to be improved the miners must be taught the necessity of greater care and the managers must insist on the enforcement of the regulations. Many managers and many miners are careful. Some are not.

Possibly the fault is that the mines are not inspected frequently or carefully enough. The inspectors are faithful in the performance of their duties, but there are not enough of them.

PORCUPINE

The gold mines at Porcupine are showing up remarkably well as development progresses. There is now no doubt whatever that a large production can be profitably made.

The Hollinger and Acme will both yield handsome profits from operations, both having fairly high-grade ore and a lot of it. On a smaller scale the Porcupine Crown is also doing well. The McIntyre has been less fortunate until lately; but better ore has recently been encountered. These properties are at present in a condition which augurs well for the future of the Pearl Lake section of the Porcupine district.

At the Dome mine the ore is considerably lower grade than at the Hollinger, but it has been proven that the deposit is very large.

Porcupine never looked as well as it does to-day. Its future as a gold producing district for many years is assured.

WEEKLY PAY

The members of the Provincial Workmen's Association are pressing the Nova Scotia Government to enact legislation providing for weekly pays instead of the bi-monthly pays now customary in Nova Scotia. The attitude of the coal companies can hardly be favorable to the request. At the mines of the Dominion Coal Co. during the summer of 1913 the average daily output in the week following pay-day was 1,800 tons less than the average daily output in the week preceding pay-day. On the Monday following pay-day it is not unusual for 1,500 men to absent themselves from work, and the output will fall from the maximum of 18,-

000 tons on the day before pay, to about 14,000 tons on the day after pay. This theme could be greatly enlarged upon, because it touches many debatable points having to do with social conditions, and it is largely bound up with the utterly preposterous liquor laws of Nova Scotia, and their utterly farcical administration, or it would be more correct to say their non-administration. If the coal companies oppose a change from fortnightly pays to weekly pays, it is because they fear two dislocations of their operations compared with one. The extra cost for clerical labor involved in a change from fortnightly to weekly pays is no bagatelle, but to put the matter frankly and even brutally the great fear of the operator is the "pay-day drunk." Imagine the moral obliquity of a community which legislates that liquor shall not be sold, and then with cynical deliberation sets to work to "milk" the liquor seller by means of fines, mutually arranged to help the local finances and yet not discourage the liquor-seller too much. Why not admit the necessity for the sale of liquor, license it and control it. Anything would be better than the present immoral and hypocritical attitude of the public towards the liquor traffic, which forces men to drink fearful decoctions in the vilest surroundings, and makes a lawbreaker out of every man who wishes to do something that in many countries is part of everyday social etiquette.—F. W. G.

THE VANCOUVER ISLAND RIOTS

The Vancouver Island strike riot prosecutions by the Government of British Columbia have been ended. In one case—that of an Italian organizer, sent by the United Mine Workers of America from Ohio to work in the interests of that body—an exemplary punishment of four years' imprisonment with hard labor was meted out, the activities of the convicted man having been adjudged largely responsible for the worst of the excesses committed at Extension colliery by the strikers. Other convicted men were sentenced to various terms of imprisonment, a number of them to one year in a Provincial jail, a few to longer terms, others to shorter periods, and still others were given their freedom on suspended sentence during good behavior.

In all, 217 persons were arrested, this number including a few youths. In connection with disturbances at Extension there were 50 arrested, at Ladysmith 73, at Nanaimo 76, at Cumberland 6, and at South Wellington 12. Altogether 164 were committed for trial at a higher court, nine were dismissed, and charges against 44 were withdrawn.

The cost of the prosecutions has been roughly estimated at \$150,000, but the figures are unofficial. Then there has been a large expenditure in connection with keeping the militia in the strike zone. Prominent business men of Nanaimo and Ladysmith urge the retention of the militia, fearing a renewal of disturbances if the uniformed men be removed.

One mine-owning company only—the Vancouver-Nanaimo Coal Mining Co.—has recognized the United Mine

Workers of America. It is claimed that about 300 members of the United Mine Workers are employed at that company's Jingle Pot mine, near Nanaimo. This company's production operations have been the smallest of the four companies operating on the island; further, its reserves of coal are also stated to be small—less than two years' supply, it is asserted. The Canadian Collieries (Dunsmuir), Limited—with which company the labor troubles of the last eighteen months originated—operating the Comox (Cumberland) and Extension collieries; Western Fuel Co., operating the No. 1 Shaft, Protection Island, Brechin, and Reserve Shaft mines, all in the vicinity of Nanaimo; and the Pacific Coast Coal Mines, Ltd., owning the South Wellington colliery, and the newly-opened Morden and Suquash mines—the latter situated in the northern part of the island—are together employing a comparatively large number of men, stated to reach a total of about 1,900 in all. Such seems to be the situation to-day—300 United Mine Workers of America men working at Island mines against 1,900 non-members of the organization that forced this disastrous strike on Vancouver Island. Further, more non-members of the United Mine Workers of America are available for work in the coal mines than there is work for at the present time. The demand for coal is now less than the supply, so that the mines are not being worked full time.

What the future will bring forth, it is not possible to forecast, for the United Mine Workers of America supporters are reported to be positive they will eventually compel recognition of their organization and secure its terms for its members, while the companies, with the one exception mentioned above, are stated to be fully determined not to recognize the United Mine Workers of America nor to concede its demands. So it appears that by no means has the trouble been disposed of. So long as the United Mine Workers of America continues to support its local members by giving them strike allowances, and so long as any considerable number are content to subsist on that aid, the trouble will remain. One deplorable result is that the Western Fuel Co., which was not in any way responsible for the trouble, is the heaviest loser, with the Pacific Coast Coal Mines, Ltd., also a loser, though in a much smaller degree. For the present, then, a final settlement of the dispute is certainly not in sight.—E. J.

OMINECA RIVER DISTRICT—BRITISH COLUMBIA.

As placer-gold mining in what is known as Omineca River district is again attracting attention, the following information from the official report for 1913 of F. C. Swannell,* British Columbia land surveyor, who spent the field season of last year in the district, will likely be of interest:

"I have no hesitation in predicting a great future for the great Finlay-Parsnip River valley. Agricul-

tural development will result in an impetus to the mining industry. Up to now prospecting has been almost entirely confined to search for placer-gold. Leads of copper ores and galena have been discovered close to Manson creek, and would be worked were the transportation facilities into the country bettered. A salt spring and lick was discovered 14 miles from Bulkley House on the Driftwood trail.

"The Omineca district is now entered by pack-trail from Hazelton. From Fort Babine to Manson much of the trail is very stony, with numerous steep pitches, and was very muddy, there having been more rain than usual this year. A wagon road is being built from Tacla lake to Silver creek by Mr. Bodine, about ten miles having been slashed and cleared this year. It is reported that a small gasoline steamer will be put on between Fort George and Tacla next season. During the old mining days supplies were brought in largely from Quesnel to Stuart lake, and thence by trail to Manson creek. This trail has not been kept in repair of late years. It is, however, splendidly located, dry, and the feed good, the only steep grade being at Lookout mountain. A wagon road could economically be built following this route. No trails enter the Manson creek region from the east, excepting the Moody trail from Fort Grahame. This crossed the Omineca below the Black canyon and crosses the summit of the Wolverine mountains at an altitude of about 5,500 ft. It is a very poor trail, with much soft ground, fallen timber and very steep grades over the mountain. A trail having as its ultimate object the Parsnip river runs down Manson creek to a short distance below the lower lake. The cutting of this trail through to Parsnip river is very advisable. I am informed by Mr. Steele, the mining recorder, that the country between the end of the trail and the Parsnip is good. The settlers at the junction of the Finlay and Parsnip rivers (which together form the Peace river) get their supplies from Fort George by way of Giscome Portage and Fort McLeod, but in my opinion a better way would be by the Peace river. A steamer now runs to Hudson Hope, below the Rocky Mountain canyon. A small steamer above plying on the upper Peace and Finlay would pay, especially if a wagon road were built in to Manson creek.

"The old placer-workings at Manson, Germansen, Vital, and Tom creeks were visited. At present placer-mining is being done on Manson and Germansen creeks and some quartz-mining near Fall river. Some 40 white men all told were working in this section, and a well-equipped prospecting party of five men was encountered on Stranger river. Much ground known to be auriferous will remain unworked until transportation facilities shall be improved. At present it is very difficult to get supplies or machinery in from outside, every pound having to be brought in by pack-horse or toboggan. In spite of this handicap, several hydraulic plants and two sawmills have been installed, although the latter have not been worked for some years. Easy communication with Peace river, or a wagon-road joining the one now being constructed from Tacla lake to Silver creek, would increase the mining activity in this region tenfold. Machinery could be brought to either of these points of entry by light-draught steamboats."

*Report of the Minister of Lands, British Columbia, 1913—Survey Branch, pp. D. 354-355.

A MINING ENGINEER OF THE FIFTEENTH CENTURY*

Being Some Comments on "De Re Metallica" of Georgius Agricola, 1555.

By F. W. Gray.

As a relief to the consideration of the everyday problems that confront the mining engineer in his dealings with men and materials, complicated as they are by the vexatious and kaleidoscopic social conditions that attend this present age, it may afford diversion, and possibly a little consolation, to dip into the pages of a mining engineer who did his earthly penance some five centuries ago, and whose experiences seem to have been not unlike to those now being passed through by those among ourselves who have the temerity in this topsy-turvy time to follow the profession of the mining engineer.

George Bauer was born in Saxony in 1494, long before the beginning of European colonization in North America, and he was a young man of 26 when Cortes and his Spanish braves conquered Mexico, thereby laying the seeds for a great deal of trouble among the mining engineers of our time. Bauer's work, "De Re Metallica," was published towards the end of a well-filled life, and appeared in 1555, shortly after his death. For two centuries it retained its premier position as the authority on mining. The work was written in Latin, the name Agricola being the latinized form of "Bauer" or the German for farmer. From time to time down the centuries, translations have been made, of varying merit, but it has remained for an American, Mr. Herbert Clarke Hoover, and his wife, to give to the English-speaking public a worthy and accurate translation, for which Mr. Hoover and his wife have earned the gratitude of every mining engineer who loves his profession. The translation is elucidated by full and learned annotations by Mr. Hoover, and is illustrated by all the curious woodcuts of the original work, in which one may trace the crude progenitors of the elaborate machines used in modern mining.

As the translator remarks, the work has no practical value to-day, but is interesting by reason of its antiquity, and by the comparisons it suggests with present conditions.

Agricola is decidedly of the opinion that the miner should be skilled in many arts and sciences, and specifies among the accomplishments necessary to his education instruction in philosophy (that is, natural science or physics), medicine, astronomy, surveying, arithmetic or accounting, architecture, and the law. Agricola has nothing but contempt for the ignorant and incompetent miner, and even in his limited day, appreciates the immense range of subjects with which the fully qualified mining engineer must acquaint himself, should he wish to become a "master miner." How would Agricola regard the mountain of mining literature which now confronts us, and is ever being added to, when, as in these latter days, the whole gamut of human knowledge is laid under contribution in the service of the miner? He would be both brave and sanguine who to-day would attempt a description of the whole art of mining in one volume.

A great deal of space is taken up by our worthy predecessor in defending the art of mining and miners against those who object to it as being destructive to agriculture, as inciting the passions and cupidity of men, and as not being "honorable employment for respectable people." It seems that the uninitiated have been saying hard things about our profession for a long time.

The following observations do not seem entirely unfamiliar, and perhaps could Agricola have seen the latest specimens of flotation prospectuses he might have been enabled to further extend his catalogue of "some of the wicked and sinful methods by which they say men obtain riches from mining."

"When a prospect of obtaining metals shows itself in a mine, either the ruler or magistrate drives out the rightful owners of the mine from possession, or a shrewd and cunning neighbor perhaps brings a lawsuit against the old possessors in order to rob them of some part of their property, or the mine superintendent imposes on the mine owners such a heavy contribution on shares that if they cannot pay, or will not, they lose their rights of possession; while the superintendent, contrary to all that is right, seizes upon all that they have lost. Or finally the mine foreman may conceal the vein by plastering over with clay that part where the metal abounds, or by covering it with earth, stones, stakes or poles, in the hope that after several years the proprietors, thinking the mine exhausted, will abandon it, and the foreman can then excavate that remainder of the ore and keep it for himself. They even state that the scum of miners exist wholly by fraud, deceit and lying. For to speak of nothing else, but only of those deceits which are practised in buying and selling, it is said they advertise the veins with false and imaginary praises, so that they sell the shares in the mines for one-half more than they are worth, or on the contrary, they sometimes deduct from the estimate of them so that they can buy shares for a small price."

The promoter of Agricola's day must have been a modest gentleman if he inflated his stock by one-half merely. Recent modern examples of the gentle art of fleecing lambs show great improvement in this particular branch of deceit, and in Agricola's century the agile promoter must have been woefully handicapped, when compared with his modern brother, by the lack of the untruthful camera, and the wondrous lithographs that are so useful in extracting savings from the stocking-toe. The advice of Agricola to the would-be investor can hardly be excelled to-day. He suggests that the wise and prudent man before buying shares "goes at once to the mine that he may for himself examine the vein, and consider whether he will buy or sell." What would Agricola have thought to oil wells in California, or Alberta—to come nearer home—advertised by reams of glozing lies through the columns of a syndicated press with keen financial instincts?

There is no mention of coal in the work, except a casual reference to bitumen, and the only source of power at the disposal of the miner of Agricola's century was the work of men and animals, and the natural forces of wind and water. Manual labor, aided by crude, yet ingenious, applications of the lever, screw, geared wheels and treadmills, was the chief motive power. Use was made of horses and dogs, and there is one curious illustration showing a treadmill operated by goats.

Probably the most interesting feature of the work, and certainly the most entertaining feature, is the numerous and detailed woodcuts. In the matter of illustration, Agricola's treatise puts to shame many modern technical works on mining, for the drawings are clear,

*A paper to be read at the Annual Meeting of the Mining Society of Nova Scotia, April 15.

plain and even spirited, and are not without artistic merit. Although published so soon after the invention of printing, the woodcuts in the work are of greater technical and illustrative merit than in many text-books of the nineteenth century. The illustrations of machinery show the assembled machines, and the unassembled parts. These are not shown in plan and elevation as in our modern mechanical drawing, but the component parts of machinery are shown in true perspective in the foreground, and as if laid out for inspection on the ground.

It is difficult for us who call ourselves moderns to conceive of a mining industry which does not include either the use or the mining of coal, and it is wholesome for us to see how very much it was possible for our progenitors to achieve without this now universal source of power. In Agricola's illustrations we can trace the embryo of the modern turbine, the ventilating fan, the centrifugal pump and other evolutions of the revolving wheel, but he could have had no glimmering of the possibilities—which even to us are just opening up—of electrical power, its generation, transmission and application. Compare with the modern electric hoisting engine Agricola's quaint description of the methods of descending a mine shaft with which he was acquainted. The methods shown are four in number, as follows: By ladders, by sitting on a stick, by sitting on the dirt, and by steps cut in the rock. The method described "sitting on the dirt" reminds one of the joys of boyhood, and must have so reminded Agricola, because he says: "Further, when the shafts are much inclined, miners and other workmen sit in the dirt which surrounds their loins and slide down in the same way that boys do in the winter time when the water on some hillside has congealed with the cold, and to prevent themselves from falling, one arm is wound about a rope, the upper end of which is fastened to a beam at the mouth of the shaft, and the lower end to a stake fixed in the bottom of the shaft." We are not told how the miner who adopted this method ascended to daylight at the end of his shift, but presume he either climbed a ladder, or came up "sitting on a stick."

The work goes with great fullness into the problems of mine-pumping, and the illustrations show a remarkable variety of mechanical principles applied to this work. The translator points out that up to the beginning of the 18th century water formed the limiting factor in the depth of mines, and that to the attempts to overcome this difficulty we owe the invention of the steam engine by Newcomen, and remarks "it should be a matter of satisfaction to mining engineers that not only was the steam engine the handwork of their profession, but that another mining engineer, Stephenson, in his effort to further the advance of his calling, invented the locomotive."

Bearing in mind the period at which Agricola recorded his observations he shows a singular freedom from superstition, yet he apparently accepts the then general belief that demons or gnomes haunt recesses of the mine. He refers to "demons of ferocious aspect, which may be expelled and put to flight by prayer and fasting." The belief in "kobolds" or gnomes is peculiarly Teutonic, but as the translator remarks: "The German miners were not alone in such beliefs, for miners generally accepted them—even to-day the faith in "knockers" has not entirely disappeared from Cornwall. Neither the sea nor the forest lends itself to the substantiation of the supernatural as does the mine. The dead darkness, in which the "miners' lamps serve only to distort every shape, the uncanny noises of restless

rocks whose support has been undermined, the approach of danger and death without warning, the sudden vanishing or discovery of good fortune, all yield a thousand corroborations to minds long steeped in ignorance, and prepared for the miraculous through religious teaching."

All who have had to do with mine and miners for any length of time can testify to the survival of such belief, to uncanny coincidences, and to some old wife's tale predicting disaster. An interesting volume could be compiled on miners' superstitions, such as their aversion to meeting a woman when going to work in the early morning, and the awesome tales of the "red dog" seen before an explosion. Happily, however, it is but the lingering remnants of such absurd beliefs that are met to-day.

Even to-day there are those who believe in the "dowsing rod" or the divining rod, and it says much for Agricola's good common sense that he considered the use of the forked hazel twig as an aid in the search for metals to be unworthy of the attention of a serious miner. After giving logical reasons for his disbelief, Agricola remarks: "Therefore a miner, since he ought to be a good and serious man, should not make use of an enchanted twig, because if he is prudent and skilled in the natural signs, he understands that a forked twig is of no use to him, for there are the natural indications of the veins which he can see for himself without the aid of twigs."

Our author is equally incredulous of the claims of the alchemists, who flourished exceedingly in his times, and sarcastically dismisses their pretensions by remarking that if they were true the alchemists "would by to-day have filled whole towns with gold and silver."

It is only recently that the newspapers told of the deception successfully practised on a well-known diamond mine owner by a gentleman who undertook to make diamonds from base materials, and although, as we see, the claims of the alchemist have been scouted by practical miners for five centuries the species still survives, and will probably continue to survive so long as mankind is credulous and greedy of gold.

The cult of scientific management, card indexes and efficiency, had not appeared in Agricola's generation, and although Agricola would probably have been puzzled to grasp the significance of cinematograph time and motion studies, he had a sound grasp of the "fundamentals" that are being re-discovered in our day and are being christened afresh. Witness the following shrewd remarks:

When anyone, in an endeavor to increase his fortune, meets the expenditure of a mine alone, it is of great importance that he should attend to his works, and personally superintend "everything that he has ordered to be done. For this reason, he should either have his dwelling at the mine where he may always be in sight of the workmen, or else he should live in the neighborhood, so that he may frequently inspect his mining works. Then he may send word by a messenger to the workmen that he is coming more frequently than he intends to come, whereby he so frightens the workmen that none of them perform their duties otherwise than diligently. . . . Indeed the owner should frequently remain for days and nights in the mine, which in truth is no habitation for the idle and luxurious. That mine is well conducted in which not only the foreman but the owner himself gives instruction as to what ought to be done."

We now say that "eternal vigilance is the price of safety"; we improve the mine supervision and call it the "safety first movement." Different times, different names, but after all human nature appears to have varied little in the course of ages.

In these days of "scheduled occupational diseases" and compensation acts, the mine manager has perforce to take cognizance of the diseases to which miners are liable, and we are all becoming more or less familiar with the pathology of the miner. Agricola seems to have been as discerning in this matter as in all others connected with his profession, and he mentions the tendency of the miner to rheumatism, to consumption, to infected wounds, and to accidents at work. He instances how these ailments and accidents can be guarded against, and is of the opinion "that we should always devote more care to maintaining our health, that we may freely perform our bodily functions, than to making profits."

Modern doctors state the miner is prone to neurasthenia. A prominent English physician attributes this characteristic to the dangerous nature of their work and the influence of heredity. "A miner's frame of mind on going to work is one of unconscious apprehension, and the effect of this mental condition from one year to another, and from one generation to another, has an important influence upon the etiology of neurasthenia in this class of men."

Compared with his modern representative the miner of Agricola's time had ample reason to be nervous, but we find it stated on the contrary "while the workmen are carrying out their tasks, the depths of the earth often resound with sweet singing, whereby they lighten a toil which is of the severest kind and full of the greatest dangers."

Notwithstanding the gloomy dictum of the physician just quoted it is stated by him that the British mortality figure from all causes of death was only 88 for coal miners, as compared with 100 for all occupied males. The social condition of the miner has been steadily improving in our time, and is still improving, though with greater rapidity than in the past, and we prefer to believe that the mental and bodily health of the miner were never so good in the history of the world as they are to-day.

It is not stated anywhere in the treatise that women were employed in mining, but several of the illustrations show that females worked at the lighter operations such as sorting ore and on the concentrating tables.

The basic principles of the art of surveying appear to have been well understood by Agricola's contemporaries, but as in the case of mechanical drafting, they do not appear to have apprehended the science of plotting and plan-making to scale. The work shows illustrations of triangulation, of the plumb-bob, plummet level and what is practically a plane-table. A compass is also shown very similar to a modern instrument, but it does not appear to have been used in recording angles, but merely to ascertain the geographical direction. The limitations under which the surveyor of Agricola's day labored may be gathered from the fact that all underground surveys were plotted on the "surveyor's field," *i.e.* were reproduced at full scale on a level piece of ground, and mine plans on a reduced scale were the development of a later time.

Our learned author wrote many other books during his lifetime, and seems to have contemplated some that have either been lost or were not published. He wrote regarding fossils, regarding the animals that live underground, and was the author of various works on grammar, medicine and theology. He also found time to write advocating war with Turkey, having evidently appreciated the disastrous effects on European civilization to be apprehended from Mussulman domination. Nevertheless, after a life of unremitting labor, his body was refused burial because of his religious beliefs, and

in his native town no memorial exists of the great services he rendered to the mining profession. But Agricola's hatred of charlatanism and superstition, his appreciation of the many-sidedness of his honorable profession, and that for the learning thereof there is no royal road, no means of final attainment but labor itself; are worthy of perpetuation, and of emulation by mining engineers of our day. In Agricola's own words, the mine is no place for the idle or the luxurious.

THE INFLUENCE OF NICKEL ON SOME COPPER ALLOYS.

Summary of Paper, by Professor A. A. Read, M. Met., and R. H. Greaves, M.Sc. Read at the Annual General Meeting of the Institute of Metals, held in London on March 18th, 1914.

The influence of varying percentages of nickel on some mechanical and physical properties of the copper-aluminum alloys, with 5 and 10 per cent. of aluminum respectively, has been investigated. Hot, rolling and forging tests showed that apart from increased hardness and the necessity of a higher rolling temperature, the behavior on hot rolling of alloys with up to 7½ per cent. of nickel was identical with that of the pure copper-aluminum alloys. Malleability and ductility are rapidly reduced by nickel in the 10 per cent. aluminum series, but with 5 per cent. of aluminum the presence of nickel increased the ductility as judged by the wire drawing tests.

The main features of the tensile, hardness and alternating stress tests considered in conjunction with the microstructure may be stated briefly as follows:

(1.) **Alloys with 10 per cent. of Aluminum.**—Nickel up to 10 per cent. in the chill castings gives increased maximum stress and yield point at the expense of elongation and reduction of area; 5 per cent. of nickel gives maximum hardness; 5 per cent. of nickel improves the annealed metal and diminishes the detrimental effect of annealing on the 10 per cent. aluminum alloy. This composition corresponds to the limit of the alpha plus beta structure, increase of nickel above 5 per cent. being accompanied by the separation of a blue constituent in place of beta. The effect of quenching on these alloys is similar to that on the 10 per cent. aluminum bronze, but becomes less marked as the nickel increases.

(2.) **Alloys with 5 per cent. of Aluminum.**—Both in the chill castings and annealed rods, nickel has little effect on the hardness, maximum stress and yield point until 5 per cent. is present. The ductility, however, is greatly increased by 1 per cent. of nickel. With less than 5 per cent. of nickel, the alloys consist of a homogeneous solid solution; with more than 5 per cent. a second constituent separates on slow cooling, causing in the annealed rods a rapid increase in hardness, maximum stress and yield point, with an accompanying diminution in elongation and reduction of area. The effect of quenching on the alloys with 5 per cent. of nickel and over is to retain the second constituent in solid solution and thus to increase the ductility, while the hardness, maximum stress and yield point diminish. The rate of cooling need not be very great for air-cooled rods gave results which approximate to those of the quenched.

The presence of nickel makes practically no difference to the specific gravity of these alloys; their melting points are raised, and conductivity for electricity greatly diminished. Corrosion by sea water is greatly reduced by the presence of nickel; there is no difference in behavior between the annealed and cold rolled metal. All the alloys with 5 and 10 per cent. of aluminum and varying nickel behaved better, both in fresh and sea water than either Muntz metal or naval brass.

TOUGH-OAKES GOLD MINE, KIRKLAND LAKE, ONTARIO

By the Editor.

Kirkland Lake is Ontario's newest important productive gold district. The lake from which the district took its name lies about four miles north-east of Swastika, a station on the Ontario Government Railway. Swastika is 60 miles north of Cobalt and 390 miles from Toronto. There is daily train service to Swastika and daily stage service from Swastika east to the Teck-Hughes and Tough-Oakes mines.

The Tough-Oakes is the most promising property in the district, and the one on which most work has been done. The five claims, comprising 185 acres, are located in Teck and Lebel townships, about five and one-half miles from Swastika.

Development work.—At the Tough-Oakes property a number of gold quartz veins have been discovered, and two of these, No. 2 and No. 3, are now being developed. The former has been opened up by a shaft now, March 30, 280 ft. deep and by short drifts at the 100 ft. and 200 ft. levels. A shaft is being sunk on the No. 3 vein and is, on March 30, 75 ft. deep. Both

Mr. Burrows' geological map of the district was issued last summer. Mr. Hotchkin's map is similar, but more detailed. It covers a comparatively small area.

It will be noticed that the rocks nearest the veins are porphyry, conglomerate, greywacke and lamprophyre. Mr. Burrows considers that the conglomerate and greywacke is of Timiskaming age, while the porphyry and lamprophyre are later intrusives. The ore occurs in veins in the porphyry and in the sediments near the porphyry. No ore has been found in the lamprophyre.

The Gold Deposits.—The surface exposure of No. 2 vein shows it to be in conglomerate near a mass of porphyry. The vein approaches the porphyry towards the west. The vein strikes east and dips south at about 60°. At the 100 ft. level the drift west encountered porphyry a few feet from the shaft. The igneous rock bulges down from the hanging wall for a few feet, and the drift passed through it in a few cuts. Continuing west along the vein porphyry was again



SURFACE PLANT AT NO. 2 VEIN
Tough-Oakes mine, Kirkland Lake, Ont.

shafts are being deepened and the drifts on No. 2 vein are being extended. Only a few drills are in operation, but good progress is being made. The plant is not sufficient for extensive operations. A new compressor is now being installed, and arrangements have been made that will result in the company soon having plenty of electric power to drive all the machinery required at the mine.

At present the development is being pushed as rapidly as the power supply will permit. There are three eight-hour shifts. Two plugger drills are used in shaft sinking. The drifting is done partly with hammer and partly with piston drills.

Areal Geology.—The accompanying sketch, made by Mr. R. E. Margenau, from the mine maps prepared by Mr. M. W. Hotchkin, shows the location of the veins and their surface relationships to the rocks enclosing them. Mr. Hotchkin in making his map had the use of studies concerning the geology of the area made by Mr. A. G. Burrows, of the Ontario Bureau of Mines.

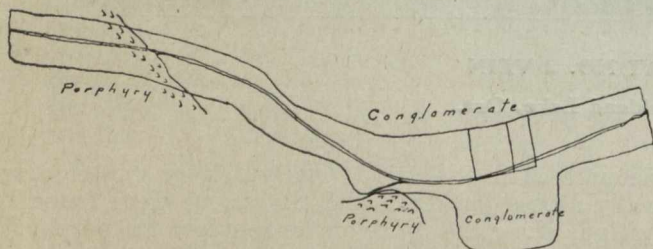
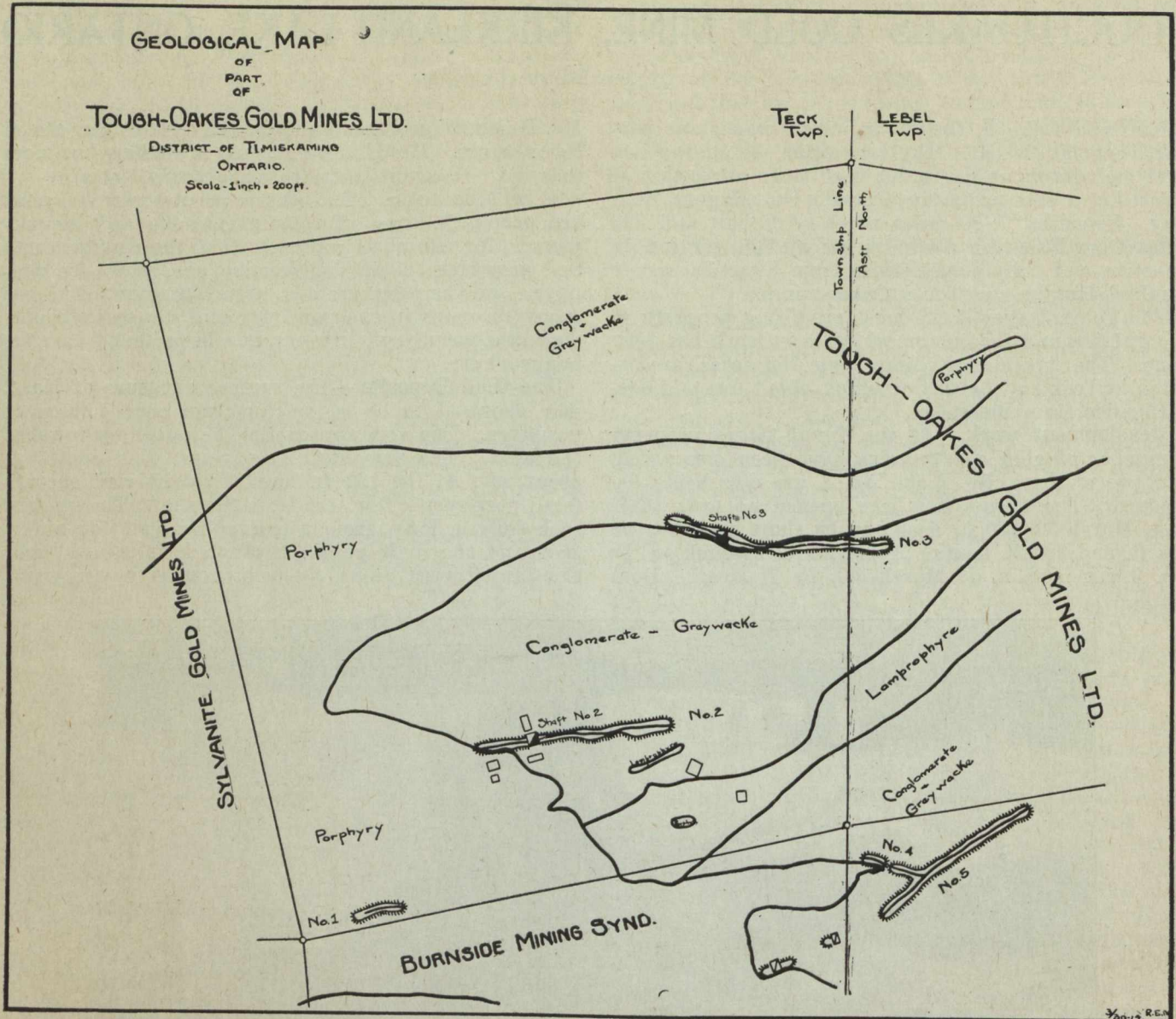
encountered in the drift. The porphyry crosses diagonally across the drift, and the values were found to continue along the strike of the vein into the porphyry. Just at the contact the values are said to have been low; but very good ore is now being broken in the west drift, where the vein is entirely in porphyry.

The east drift is in the sedimentary rocks entirely. So is the east drift at the 200 ft. level.

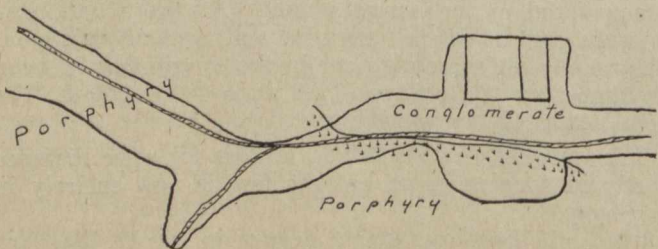
In following No. 2 vein downwards porphyry was encountered in the hanging wall. At the 200 ft. station the contact is well exposed and is clearly defined. The vein is for some distance in the conglomerate, near or almost on the contact. At a depth of 280 ft. the vein is entirely in porphyry.

The west drift at the 200 ft. level is for some distance partly in conglomerate; but the face is now entirely in porphyry.

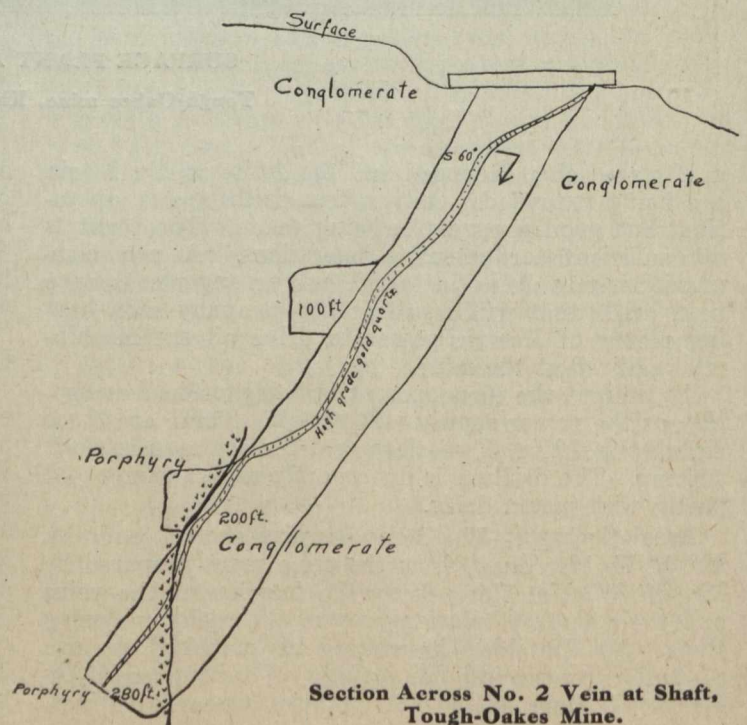
The gold bearing quartz occurs in rock that has been very much fractured. Fracturing took place both before and after the deposition of gold. That



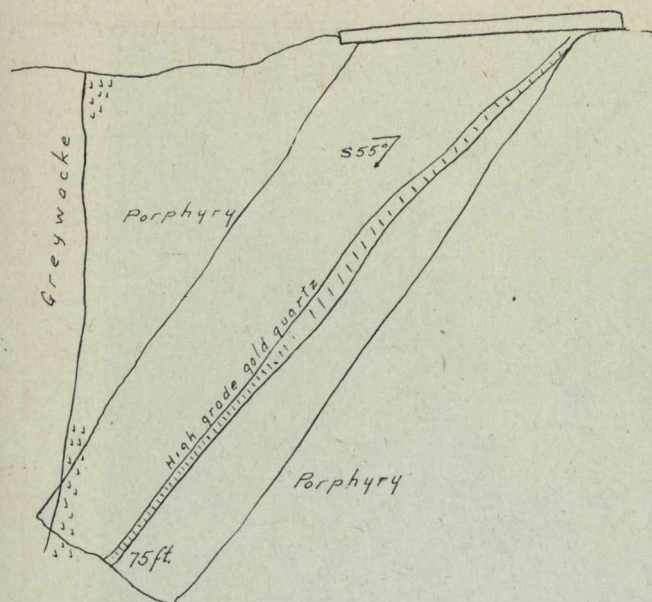
Sketch Showing Workings on 100 ft. level, No. 2 Vein, Tough-Oakes Mine



Sketch Showing Workings on 200 ft. Level, No. 2. Vein, Tough-Oakes Mine



Section Across No. 2 Vein at Shaft, Tough-Oakes Mine.



Section Across No. 3 Vein at Shaft, Tough-Oakes Mine

fracturing preceded deposition is quite evident from the fact that gold is frequently seen on fractured surfaces. That subsequent fracturing took place is evident from the numerous small faults in the veins and the presence of veins which cut across the ore. This fractured zone has evidently been impregnated with gold bearing solutions. In many places good assays are obtained in rock which contains no distinct quartz

cate. In places scarcely any distinct quartz vein is visible. In places the vein is several inches wide. In places there are two veins close together. No attempt has been made to show all these numerous irregularities in the illustrations.

At the contact west of the shaft, at the 100 ft. level, there are two distinct veins, a short distance apart. One of these continues fairly regularly along to the west, the fissuring seeming not to have been affected seriously by the nearness of the porphyry. The vein lying nearer the porphyry, however, turns suddenly to the contact and follows along the contact.

In the west drift, at the 200 ft. level, the most conspicuous vein is the one which turns towards the hanging wall. The main fractured zone seems, however, to be further in the footwall. High assays were obtained there and the drift continued in the fractured zone. The porphyry in the west face shows numerous thin black seams, which are rich in gold and in many places carry visible gold.

The veins do not cross the porphyry-conglomerate contact so abruptly as shown in the sketches. They follow along close to the contact for some distance, and it is not easy to point out the exact place at which the vein may be said to enter the porphyry.

The Ore.—The gold occurs in very narrow quartz veins and in the fractured rock enclosing the veins. The vein material is high grade and much of this ore has been sorted out and shipped without treatment at the property. The remainder of the ore broken in development work is of good grade and much of it has been crushed in a 5 stamp mill on the property.



Tough-Oakes Office, Laboratory, Stores and Camp Buildings

veins, but which is much fractured and has a thin deposit of minerals on the fractured surfaces.

No. 3 vein at surface is partly in porphyry and partly in greywacke. It strikes east and dips south at about 50°. A shaft was started in the porphyry and is, on March 30, 75 ft. deep. The last cut shows a little greywacke in the hanging wall. The ore broken in development work is partly high grade vein matter and partly lower grade wall rock. The vein is, like No. 2, only a few inches thick; but very rich.

The accompanying sketches illustrate the geological structure. These illustrations are merely sketches, not accurate drawings. They will, however, serve, I hope, to make more clear some structural features of the deposits. To Mr. M. W. Hotchkiss, assistant manager for the company, I am indebted for most of the information from which the sketches were made, and in part for the sketches also.

The veins are not as regular as the sketches indi-

Native gold and tellurides both occur in the ore. There are at least two tellurides, one rich in gold and one containing little or none. While the gold tellurides are of little importance in comparison with the native gold, it has been found that tellurides are generally present in the ore, and can generally be detected in the rich ore.

The native gold occurs in many places in particles large enough to be readily detected by the naked eye. Very frequently the particles are associated and were apparently deposited on a black soft substance, which contains molybdenite. This black substance occurs very commonly as a coating on the fractured surfaces of the quartz and country rock.

Silver probably occurs both in the native gold and in the tellurides. Analyses are not yet available, but the recovery on the amalgamating plates in the mill indicates the presence of silver in the native metal.

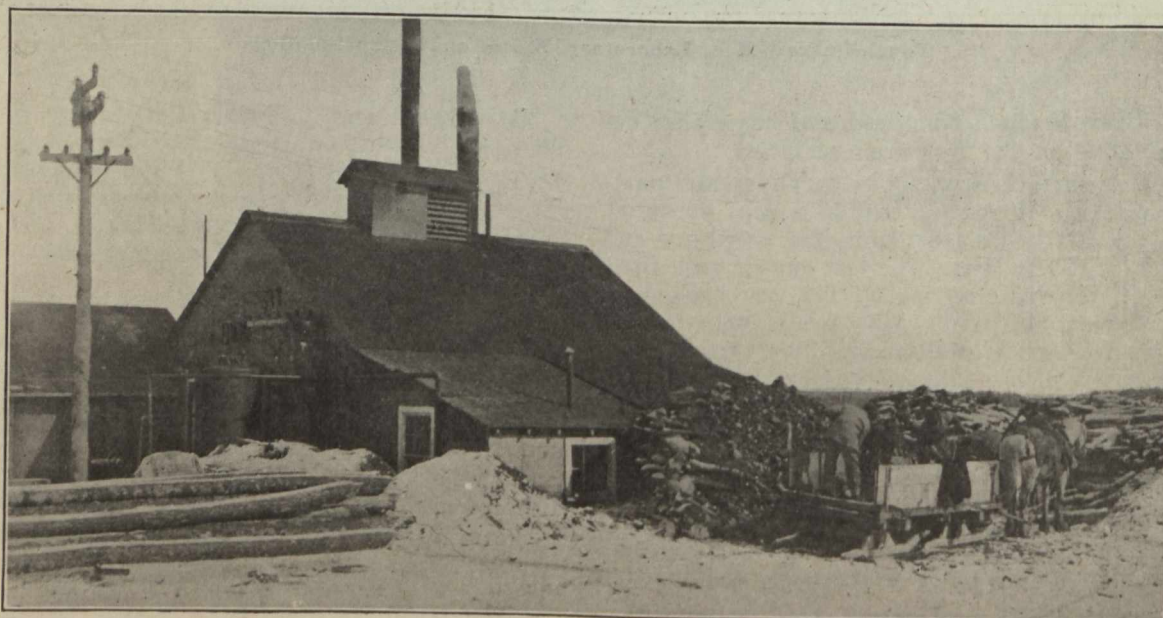
During 1912 two shipments and during 1913 three



Shaft on No. 3. Vein, Tough-Oakes Mine



No. 2 Vein Shaft House and 5 Stamp Mill, Tough-Oakes Mine



Tough-Oakes Power House



Logging Operations on Claims Adjoining the Tough-Oakes

shipments of vein material were made. The 101.049 tons contained in these five shipments contained 2,183.756 oz. of gold and 4,025.58 oz. of silver. The gross value was \$46,221.20, and the net value \$44,005.31.

The 5 stamp mill was started in the early summer of 1913, and during the remainder of the year treated 1,975 tons of ore, which yielded 1,272.446 oz. of gold and 198.28 oz. of silver. The gross value was \$26,348.87. Only about 50 per cent. of the gold was recovered. The tailings are ponded for future treatment.

The following tables show the character of the several shipments made to Dec. 31, 1913:

These figures show that a portion of the high grade ore broken in development work yielded over \$400 per ton, while the low grade yielded about \$13 per ton and contained about \$25 per ton, the balance not yet recovered. The best method of recovering the gold in the tailings is still to be determined.

According to Mr. Charles O'Connell's report of January 24 the average value of the milling ore then exposed was \$23.30 per ton.

The Tough-Oakes promises to be when equipped a very profitable gold mine. The development work so far has been very encouraging and already there has been partially blocked out ore of a very considerable value. The openings are not extensive, but according to the report of the manager there was about three-quarters of a million dollars in sight at the beginning of the year. Mr. H. H. Johnson, who examined the mine last December, estimated the reserves at about \$1,100,000. Since that time there has been considerable addition to the reserves. None of the estimated ore is blocked out on four sides.

Recently the control of the property was taken up by Kirkland Lake Proprietary, Ltd., and later the Tough-Oakes Gold Mines, Ltd., was formed to acquire it from Kirkland Lake Proprietary. The Tough-Oakes Gold Mines, Ltd., is capitalized at £500,000 in £1 shares.

Mr. Chas. O'Connell is manager of the mine, Mr. M. W. Hotchkiss assistant manager, H. Herbert, accountant, R. E. Margenau engineer and Fred Jost mill superintendent.

Ore Shipments During Years of 1912 and 1913, Tough-Oakes Gold Mines, Ltd.

Shipment.	Date.	Net dry tons.	Oz. per ton Silver.	Oz. per ton Gold.	Gross Value.	Net Value.
A	Sept. 8, 1912	1.892	.....	17.451	\$660.37	\$660.37
B	Dec. 21, 1912	19.905	23.400	22.509	9,235.60	8,799.00
C	Mar. 19, 1913	20.527	33.665	19.688	8,492.23	8,120.00
D	June 5, 1913	30.438	37.900	23.040	13,147.10	12,343.50
E	Oct. 31, 1913	28.287	67.500	24.075	14,685.90	14,081.91
		101.049			\$46,221.20	\$44,005.31

Bullion Won From 1,975 Tons Milled in Year of 1913, Tough-Oakes Gold Mines, Ltd.

Bullion.	Date.	Oz. Silver.	Value Silver.	Oz. Gold.	Value Gold.	Gross Value.
Bar No. 1.....	.....	.....	.....	.....	.....	.....
Bar No. 2.....	June, 1913	50.83	\$29.54	296.175	\$6,122.48	\$6,152.02
Bar No. 3.....	Aug., 1913	28.10	16.50	207.250	4,212.75	4,229.25
Bar No. 4A.....	Sept., 1913	43.86	26.53	280.321	5,794.75	5,821.28
Bar No. 5A.....	Nov., 1913	37.84	22.42	233.662	4,830.23	4,852.65
Bar No. 6A.....	Dec., 1913	37.60	21.57	255.038	5,272.10	5,293.67
		198.23	\$116.56	1,272.446	\$26,232.31	\$26,348.87

VANCOUVER ISLAND RIOT CASES

In British Columbia the prosecutions for unlawful assembly, rioting, and other breaches of the law in connection with the strike of coal mine employes on Vancouver Island have been brought to a conclusion. In view of the fact that there still remained more than fifty of the accused to be tried by the Supreme Court, that large expense was being incurred, that serious inconvenience and loss to those of the public who had been summoned as jurymen as well as to the accused themselves and their families where married men were concerned, and that there was a widespread feeling that the law had been sufficiently vindicated by the numerous convictions obtained, and it becoming known that the Provincial Government was disposed to be lenient, an arrangement was made between the Attorney-General, representing the Government, and counsel for the men still awaiting trial by which the remaining fifty-two cases were to be immediately disposed of. Under this arrangement charges which were not very serious were withdrawn in twenty cases, while in the cases of practically all the others a plea of guilty of unlawful assembly was to be entered. A few of the accused declined at first to consent to pleading guilty, but eventually they joined the large majority, and so the longest criminal assize in the history of British Columbia was brought to an end, the closing act having been the sentencing, on March 23, of those convicted during the assize. One man was sentenced to four years in the penitentiary, eight to one year each in a provincial jail, one to six months and another to a like term, but to be less the four months he had already spent in jail. Four others were sentenced to the time they had already served while awaiting sentence, and the remainder, with the exception of two postponed cases, were allowed their freedom on suspended sentence. These were not all the convictions, for nearly five months previously about 40 men of those who had chosen speedy trial in a lower court were sentenced to various terms of imprisonment.

The man sentenced to four years' imprisonment, Joe Angelo, was at the time of his trial, early in January, thus described in a Vancouver daily newspaper: "Joe Angelo is a well-appearing man. Swarthy of countenance, he betrays his Sicilian home in his broad shoulders and rounded head. His countenance is open and rather pleasing. A broad intelligent forehead and finely chiseled Grecian nose are appropriately matched by a well-modelled mouth beneath a nut brown mustache, and a firm strong chin. His eyes seem ever changing in expression. He is a middle-aged man, his raven black hair being tinged with grey. He has been identified with the United Mine Workers of America for years, and his ability as an organizer was responsible for his selection by the union officials at the headquarters in Indiana when the officers of District No. 28 (Vancouver island) asked for a man to instruct the foreigners in the principles of unionism. His home is in Bridgeport, Ohio, where his wife and four small children reside. He arrived in Nanaimo shortly before the strike and at once commenced his work among the 600 Italians who work in the Vancouver Island collieries. Bail was refused Angelo after his arrest, and he has been held in jail ever since he was apprehended in August last. When ordered to stand up for pronouncement of sentence and asked by the judge what he had to say, Angelo replied: "I am not guilty of the charges, and I have a wife and four children." He was followed by his counsel who besought clemency on the grounds that he was an alien and

a married man. The judge addressed the prisoner thus: "Yours is a very grave offence, and there are very few extenuating circumstances. You are a member of a powerful organization, and no doubt your family will be taken care of. The fact that you are an alien is hardly a circumstance in your favor. Your appearance synchronized with the outbreak. Your influence led these other men to do what they have been found guilty of. Whether you have been a tool or not of others, I have my own views as to that." The judge then commented upon the fact that a great deal of damage had resulted from the offences that Angelo had been accused of. He sentenced him to four years in the penitentiary.

Going back to the time of Angelo's trial, the following is an excerpt from a report of the proceedings: "Angelo, it is charged by the Crown, is one of the men who planned the riots which occurred at Extension colliery when a crowd of 600 or 700 men invaded the peaceful little mining camp in the hills and after driving the non-union workers and their families to the woods under a hail of bullets, applied the brand to their homes, and in the dusk of the autumn evening looted and pillaged by the light of the burning houses. Mrs. Charlotte Scavardi was the chief witness for the prosecution. In a clear, ringing voice this young woman told the story of how she and her babes had been driven over the hill to the fringe of the forest, where they remained all night, to return late the next day under military escort to view the smoking remains of her home. Everything that she and her husband owned—the savings of years of toil in the mines—had been, she testified, wiped out, and now they found themselves almost destitute."

The recent attitude of the Hon. the Attorney-General for British Columbia in regard to the men under arrest when the proposal was made that proceedings in the Courts be stayed, is indicated in the following statement made by him: "I want to deal leniently with these men. The Government does not wish to prosecute unduly, and I may say that we have always intended to take this stand when the right time came. Our attitude has been that when the law was vindicated we would deal leniently with the accused men. But we believed it was necessary to show the public of this Province that while men could strike all they liked they could not be permitted to take the law into their own hands. The law has now been vindicated, I believe." The Attorney-General has agreed to hear representations from counsel for the miners and their union officials looking to the selection of the less serious cases first, with a view to recommendation to the Minister of Justice at Ottawa for the pardon or parole or otherwise lessening the punishment of the men who have been sentenced to imprisonment. With a similar end in view, the Attorney-General will also carefully consider the cases of the men who were sentenced about the end of October in the Speedy Trials Court. Incidentally it may be stated that it is quite probable some of these men would have ere now been given their freedom but for the threats and other ill-advised proceedings of some of those who professed themselves to be friends of the prisoners. The violent language used at public meetings of Socialists, and a so-called Miners' Liberation League, and even of members of the British Columbia Federation of Labor, instead of inducing clemency, probably deterred the Department of Justice from taking action in the direction of releasing some of those in prison. An instance of the folly of some of the agitators was that of Vice-president A. Watchman, of the British Columbia Federation of Labor, who threatened the Premier of the Province, when demanding the liberation of the miners then in jail, that

if this were not granted there would be a two-day's strike of all labor in the Province at the end of January. The Premier's reply was to the effect that while a general strike, which might involve industrial ruin in the Province, would be calamitous, no threat of that kind would deter the Provincial Government, nor the Minister of Justice for Canada, from executing the laws of the land. "If the power to pardon," said he, "is to be influenced by threats of industrial strikes, a precedent would be established that could only mean disaster to the civil liberties of the people of the Province."

Another noteworthy admonition is that Mr. Justice Morrison who, speaking to the men when giving some of them their freedom under suspended sentence, said: "I hope you realize that the idea is not to punish but to prevent a recurrence of the things that you are charged with. The brainy men of labor know that you can not make progress by burning houses and assaulting and insulting others. In allowing you out of prison on suspended sentence I am trusting you, but the arm of the law is long, and if you violate our confidence you will be brought back here again, and you know that you can not then expect any consideration. I will accept your undertaking that you will not participate in any further trouble of this sort." To all of the convicted men he said: "Now I wish you to take heed of what I tell you, and it is that you can not successfully put a restraint upon freedom in this country—neither upon freedom of labor, freedom of lawful action, nor upon freedom of capital. As law-abiding citizens, it is your privilege, and I hope you will deem it your duty, to further that freedom. There is no monopoly in this country. There is no class distinction recognized by law, and therefore no class legislation. No one class of men have by law an advantage for their own special benefit. Do not be misled into believing anything to the contrary. Unfortunately most of you are made the victims of demagogues or other factious orators. You have full liberty to combine to secure an increase in wages and to secure to yourselves every necessary safeguard in your dangerous and arduous labors. Nor can it be denied that the unions have a right to enforce among their members observance of their proper rules, regulations and laws. But they have not the additional right to interfere with others as to whether they shall or shall not work just as those who choose to strike may direct. There is nothing that our laws guard more strongly than personal freedom. There is nothing each one of you would resent more quickly than any restraint of your freedom by dictation as to how you should use your trade, your intellect, your earnings—and all these privileges are as much under the protection of the law of the land as is the protection of your body. The interest of the public after all is greater than that of union or party, and the manner in which a workman shall dispose of his labor is a matter of public interest. If, therefore, a workman is interfered with by intimidation, picketing, molestation, unlawful assemblies, or riots, and is so influenced as to how he shall utilize his industry or his talent there is committed a breach of the law constituting a criminal offence. That is the law of the land, declared and enacted, not by the judges, but by you—at least, by those of you who enjoy the Canadian franchise—through your representatives in Parliament assembled. These are your laws, and they shall stand, and must be invoked in proper cases while they do stand, and for your protection as well. They shall and must be obeyed so long as constituted authority shall hold out against the anarchists, as it is abundantly able to do.

"You have been found guilty by what I consider sympathetic juries. There is not a thinker of any distinction on the subject of labor to-day who is not against the adoption of the methods charged against you and of which you have been found guilty. Had the Attorney-General, who is a sworn servant of the people, with all the information placed before him, failed to put the machinery of the law in motion for the protection of the public and to prevent a recurrence of such acts of lawlessness, he would have been unworthy of the great trust reposed in him by the people. For every act and for every cent of public money expended in those prosecutions he is accountable to the public—to you and to me, and I want you to know that his ability and the revenues of the country are at your disposal if and when circumstances require them, either for the protection of your property or your freedom as well as for your defence on charges of the alleged invasion of the right of others. No man need go undefended in this country for the want of funds if he is bona fide unable to defray the expenses of his defence in a criminal trial.

"In conclusion, I consider it my duty to burn this fact into your minds—you cannot break the laws of this country with impunity. On the very lowest ground it is, in the first place, poor policy. You can not afford it. On much higher grounds, you are violating your conscience and you know it."

THE MINERAL PRODUCTION OF QUEBEC IN 1913

A preliminary report by Theo. C. Denis, published by the Department of Mines, Quebec.

The value of the products of the Mineral Industry of the Province of Quebec in 1913 totalled \$12,918,109. These figures are compiled from returns received by the Quebec Mines Branch direct from the producers. Although they are liable to change slightly, owing to additional dilatory returns, they are sufficiently near to give an accurate idea of the condition of our mining industry.

This preliminary statement will be superseded in a few weeks' time by the more complete annual report, which will give the corrected figures as finally compiled.

The mineral production of the Province of Quebec for 1913 is the highest yet recorded. It is gratifying to note that, for the last ten years, we have an unbroken series of increases of each year over the preceding one.

Asbestos.—Returns received from eight producers show an appreciable increase in the shipments of asbestos from the producing centres of Thetford, Black Lake and Danville.

None of the East Broughton properties were reopened during the year; at Robertson, only one mine was in operation. The fibre of the East Broughton rock is short and its market value is low, but, on the other hand, the percentage of fibre recovered from the rock is high. The quality of the rock at Robertson stands intermediate between that of Thetford and of East Broughton.

There has been a marked improvement in the asbestos market, and although the conditions are not yet ideal, they are more satisfactory than they have been for several years. The working margin of profits in the asbestos industry is narrow. Taking last year's figures, we see that the production, i. e., the asbestos extracted from the rock, totalled to a value of \$3,578,-

007. This is, of course, allowing the same prices for the stock on hand as for the shipments sold. This value of asbestos was extracted from 2,527,410 tons of rock. It is true that 25 per cent. of this rock goes direct to the dump and is not treated in the mill, but nevertheless, all of it has to be quarried and hoisted to the surface from depths reaching over 200 ft. Therefore, at that rate, each ton of rock yielded \$1.42 of asbestos. In 1912, this figure was \$1.38, and in 1911 it was \$1.53.

Copper and Sulphur Ore.—Except for the very appreciable increase in the shipments of copper and sulphur ore, there are no new developments in this industry. The value of the copper and sulphur contents of these ores amounted to \$866,774 in 1913. This is an increase of \$234,811 as compared with 1912.

Iron.—The iron ore and iron smelting industry has been dormant in the Province for over two years. We have no production recorded since 1911, and the prospect for a resumption of activity is not of the brightest. The Canada Iron Corporation, which operated charcoal furnaces at Radnor and at Drummondville to treat the local bog iron ores, has placed its affairs in the hands of a receiver, pending a reorganization. The abolition of the Government bounties on iron and steel is said to have been one of the main causes of this state of affairs.

The 4,981 tons of titaniferous iron ore produced came from St. Urbain and from Ivry. It is used as an ore of titanium, of which element it contains from 18 to 30 per cent.

Graphite.—The results in the graphite industry have been very disappointing. The mills of the Dominion Graphite Co., the largest producers in 1912, did not re-open. Most of the other graphite plants report greatly reduced operations, with the exception of the Quebec Graphite Co. at Buckingham, which worked actively throughout the year, but mostly on experimental work.

Kaolin.—Although the production of china clay is yet very small, the outlook for the future is promising. The Canadian China Clay Company, who are working a deposit in Amherst township, Labelle county, have put in an experimental washing plant. This will be considerably enlarged, with some modifications, during 1914. The whole of the output of kaolin is sold to paper manufacturers, who use it as a filler.

Structural Materials.—Notwithstanding the general trade depression which prevailed during the year, it is gratifying to see that the production of structural materials more than held its own as compared with 1912. The figures for cement, limestone, granite and brick show increases. This indicates that, despite adverse conditions, the general development of the Province of Quebec was not in any way retarded, for the production of structural materials is a very good criterion of such progress.

Legislation.—During the session of the Quebec Legislature which has just closed, an amendment to the Quebec Mining Law was passed, reducing the price of mining concessions, from \$20 to \$10 an acre (according to distance from railway), to a uniform price of \$5 an acre.

Labor and Accidents.—In 1913, according to returns received, 8,996 men found employment in the mines, quarries, clay pits and ore mills in the Province of Quebec.

The total wages paid amounted to \$5,179,395. A certain proportion of these men were employed for

part of the year only, but the majority worked 300 days.

We have to record 15 fatal accidents; of these, ten occurred in the asbestos mines, four in quarries, and one in a copper mine.

HEDLEY GOLD MINING CO.

The annual report for the year 1913 of the Hedley Gold Mining Co., operating the Nickel Plate group of mines and 40-stamp mill in Camp Hedley, British Columbia, says in part:

Report of the President, I. L. Merrill.

February 20, 1914.

During the past year everything in general, at mine and mill, has gone fairly well.

The Dickson Incline has reached a depth of 700 ft., at which point we expected to drift into the ore body drilled into in 1912 by two drill holes, both showing an average of \$20 ore, but a recent test hole put down from the bottom of No. 5 Incline only showed \$7 ore. This may be a poor spot, but it leaves a chance to doubt this block of ore being of as good a grade as we estimated it in our last annual report.

We opened a large ore body with four drill holes to the northeast of No. 5 Incline, but of only an \$8 to \$9 grade.

These are the reasons for our report now showing reserves to be of lower grade than heretofore. However, we still hope actual drifting in these orebodies will prove them of a higher grade than the present work would indicate.

We are installing a new and larger water-power plant on Similkameen river, which will allow more economical work by the end of 1914.

For detailed information I submit the reports of superintendent and treasurer.

Report of the General Superintendent, G. P. Jones.

Hedley, B.C., February 10, 1914.

In the year 1913 the stamp-mill treated 70,796 tons of ore of an average assay value of \$12.03 per ton. Total assay value, \$852,261.26.

Extraction by concentration \$656,540.86

Extraction by cyanidation. 145,789.54

Total. \$802,330.40 or 94 per cent.

The ore mined during the year was taken from practically all the stopes and the value shown was the average run of the mine.

The reserve of 10,000 tons of broken ore in the stopes has been maintained.

The quantity milled this year was 341 tons greater than in 1912, and 12,891 tons greater than in 1911. The average value for the year was \$12.03 per ton; for 1912 it was \$11.19; for 1911, \$11.99.

The power plant has been taxed to its limit to keep the mill running and supplied with ore, consequently the development work done was but little more than in 1912. A new incline shaft, the Dickson Incline, has been sunk, on a 30 deg. slope, to a depth of 700 ft., and two stations cut. This Incline is 8 x 16 ft. in the clear, double-tracked, and in good shape to pass ore as soon as connections shall be made. The inclination is greater than the dip of the lime silicate in which the ore shoot lies, so it passed through into an andesite sheet, but should at 900 ft. enter the lowest ore body which we discovered by diamond drilling. The ore to the west of the 600 ft. level was indicated by a drill

hole, the core of which returned high value. Another hole has lately been drilled to check, but the core did not average more than \$7 per ton. Owing to this last hole cutting the formation at a different angle to the first hole, it may not have shown the correct value of the ore, so we have decided to drift across from the 600 ft. level and ascertain why these cores do not check.

The ground to the northeast of the No. 5 Incline and the Dickson Incline has been tested by horizontal drill holes from the No. 5 Incline, which indicate a very promising section of the company's property. One hole was drilled from each level of the No. 5 Incline, all of which cut ore, but the two lowest were the best, assaying \$8.50 per ton.

Little development has been done on the other properties. The Sunnyside No. 4 Incline is in very promising country, well worthy of considerable prospecting, as also are other sections of the company's property. Before these can be satisfactorily drilled or prospected by shaft, drift or crosscut, it is necessary that we have more power.

The directors have given instructions to proceed with the construction of a hydro-electric power plant on Similkameen river, which will generate cheaper power for the present requirements, and surplus enough for development and an enlarged mill. The power plant as designed will have a maximum capacity of 1800 h.p. and by displacing the steam auxiliary should repay for its cost within four years. With sufficient cheap power the present mill equipment can be made to treat a greater tonnage, and the gain will be apparent all around.

We estimate the reserve tonnage of ore that can be mined and milled at a profit to be equal to our last year's estimate of 413,000 tons; but, owing to the new orebodies to the north being of lower grade than usual in this mine, and the failure to check the value in the drill hole to the west of the 600 ft. level, we would not estimate the value of the present reserves at more than \$10 per ton. We, however, hope to make similar earnings per ton through cheaper power and possibly a slight increase in the tonnage. There is also a chance that drifting and stoping, while it may not show the ore to be of as high value as that shown in the hole to the west, may be equal to the average run of the mine, which has been about \$12 per ton.

During the year about 85 per cent. of the ties of the 10,000 ft. of incline tramway have been renewed; a new hoist installed at the tippel station as well as new machinery at the ore bin station. This, together with the new machinery already installed at the central station, puts the tram in first-class shape. At the mine a blacksmith shop, general store, warehouse, oilhouse, powderhouse, etc., have all been built along the track to the No. 4 tunnel, and all mine buildings have been painted and renovated. There has also been added to the powerhouse a new boiler room, all of which, together with development work, renewals, etc., have been charged to operating.

Development work for the year consisted of sinking incline shaft 700 ft. and diamond drilling 935 ft.

I am glad to say that since writing the foregoing report we have drilled another hole to the west of the 600 ft. level, which passed through 32 ft. of good ore, thus checking up with the drill holes of 1912.

Report of the Treasurer, C. D. Fraser.

The net profits for the year were \$405,254.89.

The dividends for the year aggregated \$360,000.00 or 30 per cent. upon the issued capital stock.

The undivided profits, after all dividends, were \$272,096.23 on January 1, 1914.

The directors authorized the construction of an all-the-year-round water-power plant at a cost of not over \$200,000. Work was begun in November and \$13,028.57 expended on this account by December 31. This amount has been charged to capital account. All other expenditures, including cost of Dickson Incline, new buildings, etc., were charged to operating expenses.

Statement of Operations and Earnings for 1913.

	Tons. Milled.	Assay. Value.	Recovery at Mill.	Expenditure.	Profits.
January ...	6,002	\$14.12	\$79,382.87	\$37,158.44	\$42,224.43
February ..	5,620	14.58	76,441.94	38,245.45	38,196.49
March	5,507	14.50	74,140.53	33,269.08	40,871.45
April	6,044	12.50	71,611.40	33,252.64	38,358.76
May	6,007	13.28	75,906.40	29,728.08	46,178.32
June	6,087	10.89	61,611.38	27,793.90	33,817.48
July	5,905	12.10	65,763.50	33,619.36	32,144.14
August	5,892	9.53	52,889.78	28,782.95	24,106.83
September ..	5,430	11.74	60,246.05	33,866.15	26,379.90
October	5,830	10.39	57,344.24	33,631.50	23,712.74
November ...	6,403	10.27	61,992.31	33,933.85	28,058.46
December ..	6,069	10.93	65,000.00	33,794.11	31,205.89

Totals 70,796 \$12.03 \$802,330.40 \$397,075.51 *\$405,254.89
 †Average.
 *Including \$7,402.23 interest earned on funds of this company during 1913.

CROW'S NEST PASS COAL CO.

At the annual meeting of shareholders in the Crow's Nest Pass Coal Co., held in Toronto, the report presented showed a balance of \$470,456 as the net profit on the year's operations, which was a smaller amount than for the previous year. The output of coal at the company's mines in Crowsnest district, British Columbia, in 1913 was 1,166,378 tons, which was 102,000 tons more than in 1912; the quantity of coke made was 253,541 tons, or 8,212 tons more than in 1912. The year's expenditure on development and improvements was \$178,000. Liabilities to bank were reduced \$331,000. Incidentally, the president mentioned that since the close of the year there had been a further reduction of these liabilities by \$50,000. The balance at credit of Profit and Loss brought forward from 1912 was \$419,423; added to this was the above-stated net profit for 1913 and an amount of \$26,773 at credit of subsidiary companies that had been transferred, these together making a total of \$916,652 to be carried forward to 1914 as amount at credit of Profit and Loss. Some shareholders called attention to the fact that during five years only two dividends had been paid, and those of only one per cent. each, and they asked that a dividend disbursement be made, but all that the president would do was to promise consideration of their request.

ALBERTA OIL.

A press despatch from London, England, dated March 20, follows: At a statutory meeting of the British Alberta Oil Company, held at Birmingham yesterday, Mr. John Lee, chairman, announced that the company had contracted for drilling two wells in the Alberta oilfields, located in accordance with Mr. Cunningham Craig's instructions. Drilling, it was stated, would be begun early in April. Mr. Craig, who attended the meeting, will leave shortly for Alberta, with an assistant, to complete a survey on 10,000 acres controlled by the company, which considers it the most promising area yet taken up.

THE ELECTRICAL DRIVING OF WINDING ENGINES AND ROLLING MILLS

By C. Antony Ablett, A.M.Inst.C.E., and H. M. Lyons, A.M.I.E.E.

(Continued from last issue.)

The third method by which the connections of the motor are reversed, so that it is exerting its torque against the rotation, is extremely wasteful, because the motor takes power from the line in proportion to the turning moment which it is exerting, as well as the power which is given out by the winder, corresponding to the work done by the loads in descending.

As an example of this attention may be called to the lowering diagram, with reverse current, shown in Fig. 28. The amount of energy given up by the lowering of the load is 20,900 horse power seconds. The amount of energy taken by the motor from the supply is 42,900 horse power seconds. Therefore, in order to exert the braking effect on the winder, and to absorb the power

on the depth indicator in order to slow down the cage before it reaches the bank. The proper slowing down of the cage depends on the skill of the driver, but an overwind device is fitted both in the shaft and on the depth indicator, and in case the cage overruns the bank cuts off the power from the motor and applies the brake by means of the emergency gear.

An emergency lever is provided on the driver's platform by which he can cut off the power and apply the brake, stopping the winder immediately in case of necessity. In case the power supply fails the brake is at once applied through the emergency gear.

Hoisting Men.—With the three-phase winder the speed for winding men cannot be limited automatically,

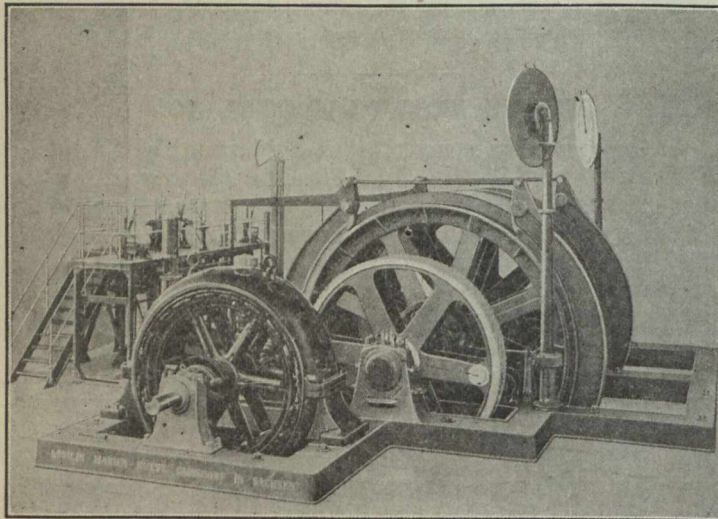


Fig. 30.—Three-phase cylindrical drum winder at H. Eckstein & Co.'s Bantjes Consolidated Mines, Johannesburg, Transvaal. This is probably the biggest three-phase gear driven winder in existence. Depth, 4,000 ft., on a 35 deg. slope. Nett load, 4½ tons. Maximum winding speed, 3,000 ft. per minute. Motor, 2,900 horse-power, at 375 r.p.m.

given up in lowering the load, which amounts to 20,900 horse power seconds, the starter has to dissipate 63,800 horse power seconds.

It will easily be seen, therefore, that when a load is lowered in this manner, the amount of energy which the starter has to dissipate is very large, and in order to enable lowering to be carried out in this way it would, in many cases, be necessary to employ a much larger starter than is required for controlling the winding engine when hoisting.

This method of lowering is the easiest to control, and, for this reason, although it is very wasteful, it is generally adopted for large three-phase winders.

Emergency Gear.—A three-phase winding engine is provided with a mechanical brake, which is brought into action by means of a weight attached to a lever, but the brake is normally held away from the brake drum by air pressure. If this air pressure fails, then the weight brings the brake on to the brake drum and stops the winder. As the speed of a three-phase winder for a given position of the control level depends on the load which is being hoisted, it is not possible to provide cams

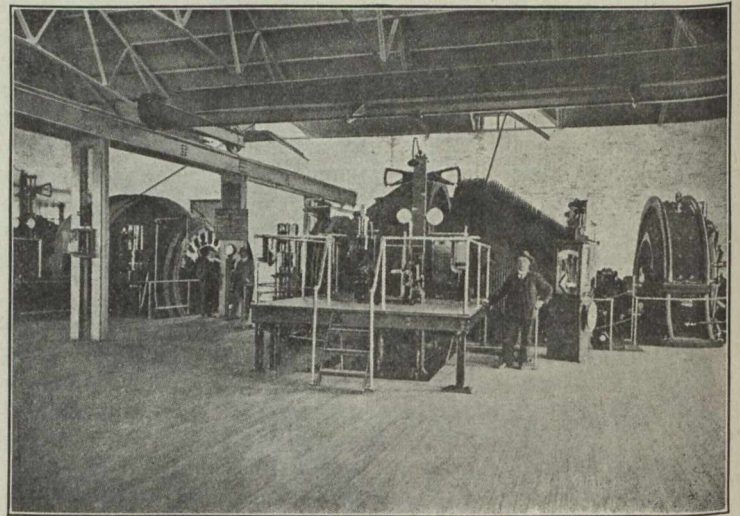


Fig. 33.—Ward Leonard conical drum winder at the General Mining & Finance Corporation Rand Collieries, Transvaal. Depth of shaft, 3,165 ft. Nett load per wind, 5½ tons. Maximum winding speed, 3,300 ft. per minute. Motor, 2,450 horse-power.

as in the case of a Ward Leonard winder, and the speed depends entirely on the skill of the driver.

Choice of Drum for Steam or Electrical Drive.

The conditions governing the selection of the type of drum differ very considerably, according to whether the winder is to be driven electrically or by a steam engine, and it is, therefore, very desirable to discuss this question in a paper on electrical driving.

It is characteristic of the steam engine that its overload capacity is not very great and that the turning moment varies according to the position of the cranks. For a two cylinder engine with cranks at right angles, such as is usually used for a steam winder, the minimum turning moment is .785 of the mean turning moment, and the maximum turning moment is 1.112.

The engine naturally must be able to start the hoist with the cranks in any position, so that the minimum turning moment must be at least sufficient to overcome the static load and friction.

An electric motor, on the contrary, has a very large overload capacity in proportion to the mean power which it will give, and, consequently, the motor for winding

engines is usually selected with reference to the equivalent continuous load, and it is very rarely indeed that the starting moment or acceleration peak needs to be considered.

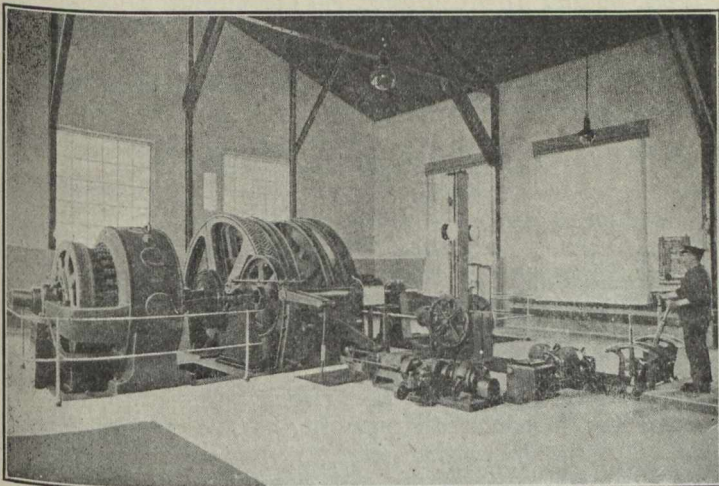


Fig. 32.—Three-phase commutator motor driven winder at the Bartensleben Pit, Germany. When sinking is completed a second motor will be added when a nett load of 3.2 tons per wind will be wound from 1,600 ft. Each motor is 310 horse-power, synchronous speed, 300 r.p.m. Maximum speed, 370 r.p.m. Maximum winding speed, 1,575 ft. per minute.

Cylindrical and Conical Drums.—The first type of drum to be employed for winding engines was the cylindrical drum, but later the conical drum was introduced.

ed. In some cases the latter gives easier starting conditions and is beneficial to the steam engine, because the rope supporting the cage at the bank top is wound off the greatest diameter, while the rope attached to the loaded cage at the pit bottom is wound on to the least diameter, so that the empty cage partially balances the rope and the loaded cage at the start of the wind.

To illustrate the relative advantages of the cylindrical and the conical drum for the electrical or the steam drive at various speeds, Figs. 34, 35, 36, 37, 38, and 39 have been worked out, while Fig. 40 is worked out for a scroll drum, and Fig. 42 for a Koepe pulley under the same conditions as are illustrated in Figs. 36 and 37. These diagrams are worked out for the following conditions:—

Nett load, 9,000 lb.; weight of empty cage and cars, 12,000 lb.; depth, 1,600 ft; diameter of rope, 1 5/8 in.; diameter of rope sheaves, 16 ft.; lead, 250 ft (approximately); cylindrical drum, 9 ft. diameter; conical drum, 9 ft. to 14 ft. diameter; with cylindrical drum and empty cage at the bank, unbalanced load, 16,800 lb.; with conical drum and empty cage at the bank, unbalanced load, 10,000 lb.

Figs. 34 and 35 are drawn for an output of 135 tons per hour. Fig. 34 represents the cylindrical drum where the maximum winding speed is 20 ft. per second. Fig 35 represents the conical drum with an equivalent winding speed. If the cylindrical drum in Fig. 34 is driven by a steam engine the horse power equivalent to the starting torque would be 678, and this starting torque has to be developed in the worst position of the cranks. The

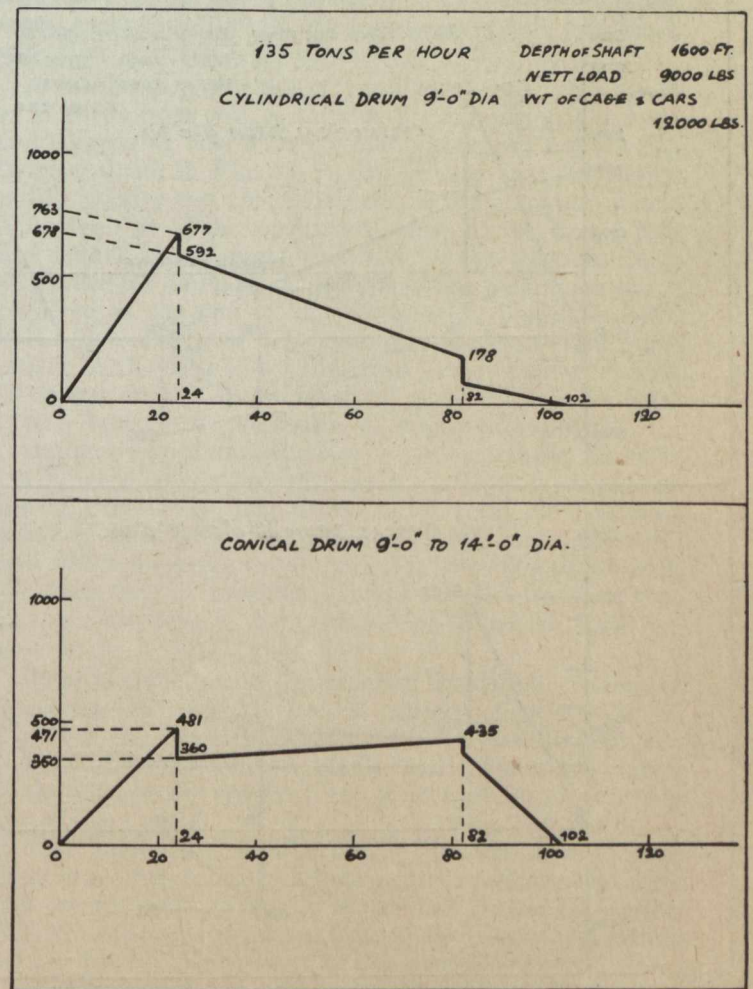
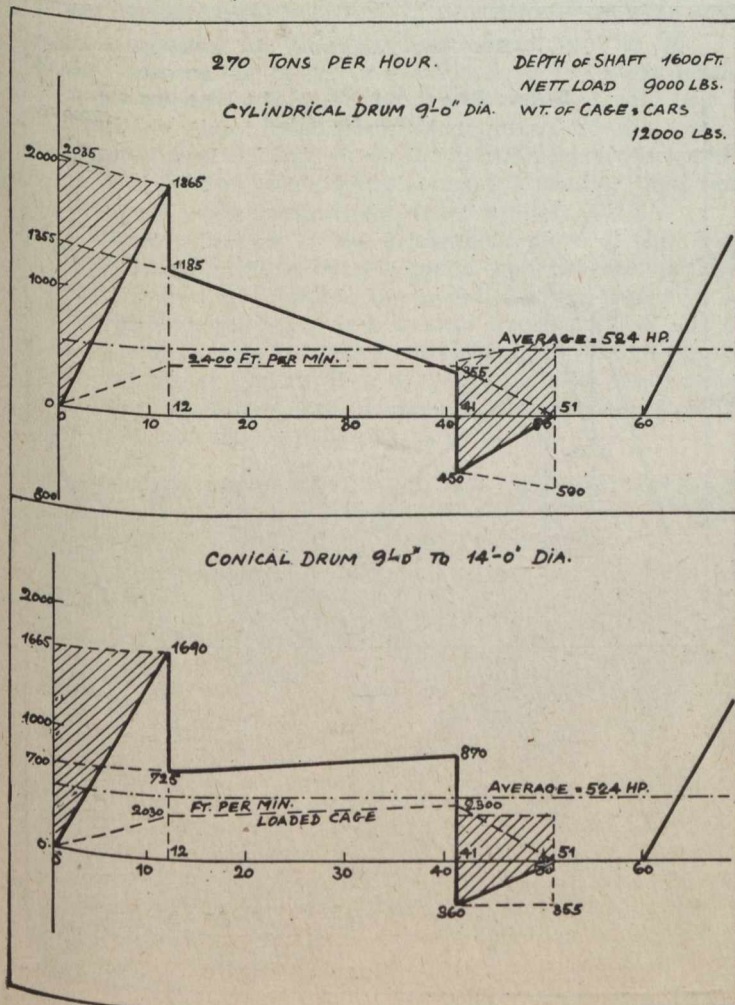


Fig. 34.—Power diagram for cylindrical drum winder, winding speed, 20 ft. per second.
Fig. 35.—Power diagram for conical drum winder, winding speed, 20 ft. per second.

Fig. 36.—Power diagram for cylindrical drum winder, winding speed, 40 ft. per second.
Fig. 37.—Power diagram for conical drum winder, winding speed, 40 ft. per second.

horse power equivalent to the corresponding average turning moment would be 865, which gives an ample turning moment for acceleration, and the maximum speed of the engine would be 42 r.p.m.

In the case of the conical drum the horse power equivalent to the starting turning moment would be 350, and to the average turning moment 445. This horse power, however, is not sufficient to provide for the acceleration turning moment, so that an engine having a maximum horse power of 481 would be required, running at a maximum speed of 33 r.p.m.

Thus, for the cylindrical drum, an 865 horse power engine running at 42 r.p.m. is required, and for the conical drum a 481 horse power engine at 33 r.p.m. is required, so that for the cylindrical drum an engine giving 20.6 brake horse power per revolution is necessary, and for the conical drum, an engine giving 14.6. The use of the conical drum, therefore, demands a much smaller steam engine.

If the winder is driven electrically a 378 horse power motor at 42 r.m.p. would be required with the cylindrical drum, and a 290 horse power motor at 33 r.p.m. for the conical drum. If the horse power per revolution be worked it will be seen that these motors are of approximately the same size.

In this case, therefore, it would be of advantage to employ a conical drum for a steam winder, but for the electrical winder, so far as capital cost is concerned, it would be distinctly disadvantageous, because there is no saving effected with the electrical plant and the wind-

ing engine with conical drums is considerably more expensive than that with cylindrical. The maximum power, however, taken from the supply system, is reduced nearly 30%.

Figs. 36 and 37 are worked out for an output of 270 tons per hour. Fig. 36 shows the case of the cylindrical drum where the maximum speed of winding is 40 ft. per second, and Fig. 37, that of the conical drum with an equivalent speed. An inspection will show that in

Table Showing the Influence of the Different Types of Drums on the Electrically Driven Winding Engine.

	Cylindrical drum.	Conical drum.	Scroll drum.	Koepe pulley.
Depth—1,600 ft.				
Output—270 tons per hr.				
Power of motor	1,090	965	780	935
Speed of motor	84	66	62.7	97
H.P. per revolution	13	14.6	12.4	9.6
Maximum peak with Ward Leonard system	1,865	1,690	1,390	1,276
Average loss of power with 3-phase system, h.p.	325	260	170	341

these cases the size of the steam engine is determined by the turning moment corresponding to the acceleration peak. For the cylindrical drum a steam engine capable of giving 2,035 horse power at 84 revolutions will be required, and for the conical drum a steam engine capable of giving 1,690 horse power at 66 revolutions will be required, i.e., a slightly larger steam engine will be required for the conical drum. It should be noted, however, that in the case of the cylindrical drum if constant eeceleration is not assumed it would be possible to reduce the maximum horse power of the steam engine from 2,035 to 1,950.

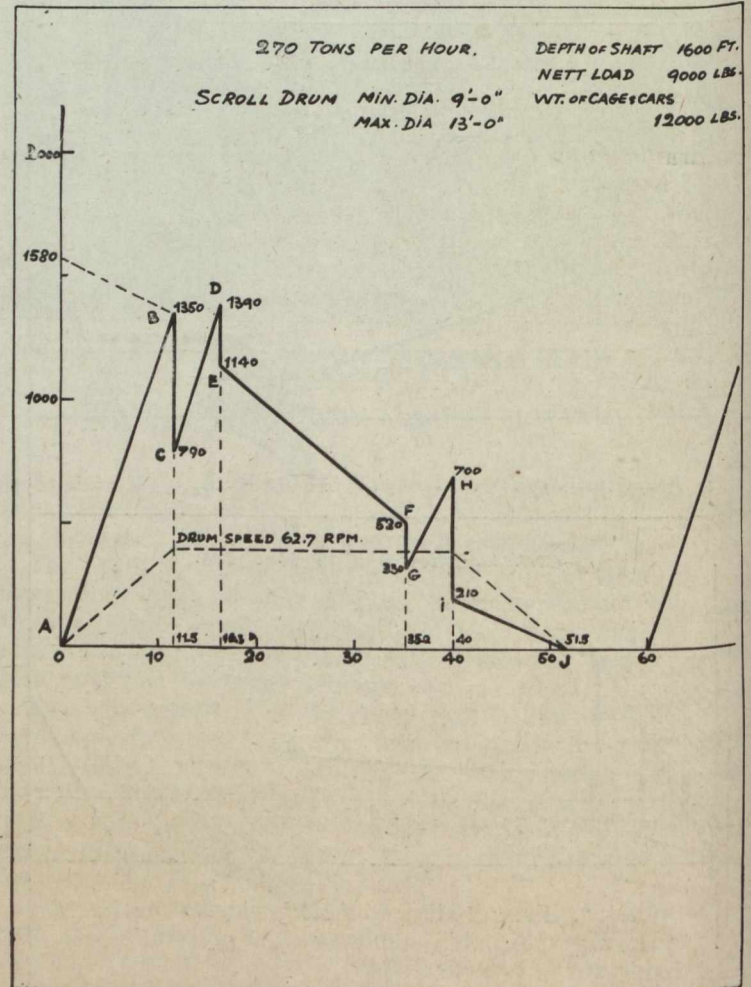
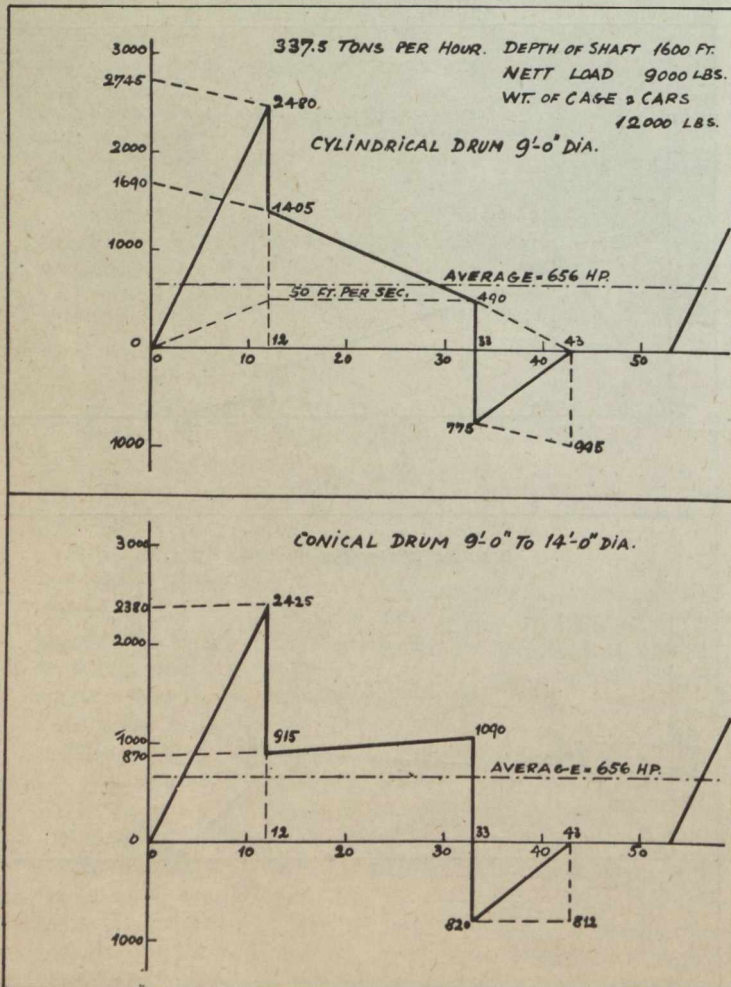


Fig. 38.—Power diagram for cylindrical drum winder, winding speed, 50 ft. per second.
 Fig. 39.—Power diagram for conical drum winder, winding speed, 50 ft. per second.

Fig. 40.—Power diagram for scroll drum winder, winding speed, 40 ft. per second.

Should the electrical drive be adopted, a 1,090 horse power motor at 84 revolutions would be required for the cylindrical drum, and a 965 horse power motor at 66 revolutions of the conical drum, so that a larger motor is required for the conical drum.

Figs. 38 and 39 are worked out for an output of 337.5 tons per hour. Fig. 38 shows the case of a cylindrical drum where the maximum winding speed is 50 ft. per second, while Fig. 39 shows the case of a conical drum with an equivalent winding speed.

It is easily seen that if a steam engine is used to drive this winder, a larger engine will be required for the conical drum than for the cylindrical. In the case of the electrical drive a 1,490 horse power motor at a maximum speed of 105 revolutions would be required with the cylindrical drum, and 1,390 horse power motor at a maximum speed of 83 revolutions for the conical drum.

Cylindroconical or Scroll Drum.—Fig. 40 is a power diagram for a winder provided with a cylindroconical drum worked under the same conditions as those assumed in working out Figs. 36 and 37.

In the case illustrated in Fig. 40 the small cylindrical portions at each end of the scroll drum are 9 ft. in diameter, and each carry six turns of the rope. The conical or scroll portions increase in diameter from 9 ft. to 13 ft., and each carry five turns of rope. The large cylindrical portion is 13 ft. in diameter and carries 31 turns of rope.

If a steam engine were used to drive this scroll drum winder, an engine capable of giving 1,465 horse power at a maximum speed of 62.7 revolutions will be required, and this is a smaller engine than would be required for the conical drum of Fig. 37, and slightly smaller than that required for the cylindrical drum in Fig. 36.

If this winder is driven electrically a 780 horse power motor at 62.7 revolutions would be required, and this is a smaller motor than would be required for the conical drum winder of Fig. 37, or the cylindrical drum winder of Fig. 36, the latter being about 4% smaller than that required for the cylindrical drum winder.

The capital cost of the mechanical parts of the scroll drum winder is, of course, more than the cost of that for a cylindrical winder, but it is not so great as that of the mechanical parts of a conical drum winder, and if this winder is to be driven on either the Ward Leonard or the Ilgner system, it is probable that the scroll drum winder represents one of the cheapest combinations in capital cost that can be put in to do the work.

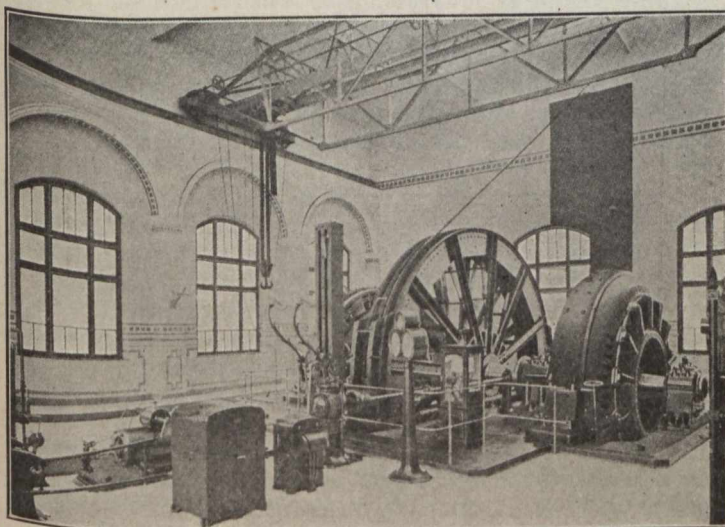


Fig. 41.—Koepe Pulley Ilgner winder at the Emscher-Lippe Pit. Depth of shaft, 3,000 ft. Nett load per wind, 6 tons. Maximum winding speed, 3,950 ft. per minute.

Should this winder be driven on the Ward Leonard system it should be pointed out that the maximum peak in power which it requires is 25% less than that required with the cylindrical drum winder.

Koepe Pulley Winder.—This type of winder is used to a considerable extent in Europe, particularly in Germany. It differs from any other type, as the rope is not wound on to and off drums but is carried over the pulley and makes contact with it for less than a single turn. Thus the rope from the ascending cage comes up the shaft over the driving pulley of the winder, and then down to the descending cage, being suitably guided by head sheaves.

It will thus be seen that the winding rope is driven by friction alone, and, consequently, there must be a very definite limit between the pull in the ascending rope and the pull of the descending rope, otherwise the rope will slip on the pulley, and, to keep the difference in pull of the two sides of the rope as small as possible, a balance rope is always necessary.

It should be noted that such a winder cannot work with a very high acceleration, otherwise slipping of the rope will take place. As the rope is bound to creep on the pulley to a certain extent, the depth indicator must frequently be reset to ensure its accuracy.

As with a Koepe pulley winder the axial length of the pulley is very short indeed compared with that of a drum on which the rope has to be wound, and as the weight of the winding drum is not increased by the rope which it is carrying, the moment of inertia of the revolving parts of a Koepe pulley winder is small, and this, together with the use of the balance rope, keeps the maximum acceleration peak comparatively small compared with that of other types of winder.

A 935 horse power motor running at maximum speed of 97 revolutions will be suitable for driving this winder, and comparing this with the motor required for the cylindrical drum in Fig. 36, it will be seen that the Koepe pulley winder can be driven with a 25% smaller motor.

As the cost of the mechanical parts of the Koepe pulley winder is not great this will be the cheapest form of winder for doing the work, and as the maximum power required at the end of the acceleration period is 1,276 horse power, or over 30% less than the maximum horse power in the case of a cylindrical drum winder, it will, if driven on the Ward Leonard system, have the least severe demand on the source of electrical supply.

Generally speaking, the Koepe pulley winder shows to the greatest advantage with deep shafts as it avoids the use of excessively long drums, and, from the electrical point of view, where the winding speed is not very high and where the acceleration period is short compared with the total time of winding. It has the disadvantage that if the rope breaks, both cages are detached from the winder.

General Conclusions Concerning Winding.—Generally speaking, the authors are of opinion that the Ward Leonard or Ilgner system of electric winding is the most suitable for vertical shafts, and for all cases where large outputs are required and short and frequent winds are made.

The three-phase winder always has the disadvantage that it cannot be so completely protected against careless handling as either the Ward Leonard or the Ilgner, but it may prove more economical for long slopes where the full speed run is a long one and the periods of acceleration are comparatively infrequent.

Regarding the choice of drums for the winding engine, the authors are of opinion that in many cases

where electrical drive is adopted, the cylindrical drum winder will prove the most suitable, but that in cases of deep shafts where the winding speed is high the scroll drum winder may prove better than the cylindrical drum winder, but that the field of application of the conical drum winder to electric winding is very small.

The authors have purposely avoided any comparison between the running costs of a steam and an electrically driven hoist or rolling mill, because each case should be considered on its own merits and comparisons made for one case will not be valid for another where conditions are different. No general comparison has any practical value, sometimes the steam engine is the more economical and sometimes the electrical plant, according to conditions, and in deciding which is the more advantageous there are other factors besides running costs to be considered.

As, however, the authors wish to see a fair comparison made in every case they should draw attention to a very fallacious method sometimes used for establishing the running cost of a steam engine, namely, either indicating the engine or measuring the water rate over an hour or two when the engine is running under the most favorable conditions, and establishing the yearly running costs from these. If tests are carried out over a prolonged period, say several months, a much higher running cost will be obtained, in some cases half as much again, as the standby losses of a steam plant are very considerable, much higher in proportion than those of an electrical plant.

The Electrical Driving of Non-Reversing Mills.

For the driving of a non-reversing mill, that is to say, a two-high, three-high, or double two-high mill, a flywheel is nearly always used in conjunction with the motor, so that the flywheel assists the motor in providing large powers necessary during the passes, when a bar is going through the rolls, thus enabling a smaller motor to be used than would be required if no flywheel were employed, and reducing the variation in power taken from the supply system.

The motor and flywheel may be either direct coupled to the mill pinions, or the flywheel may be coupled to the mill pinions and a high speed motor provided which drives the flywheel shaft through a gear, rope or drive, and in the case of a rope or belt drive, the flywheel itself is often made the large pulley.

There are such great advantages in driving a mill by a direct coupled motor and flywheel, that this method has been adopted in a great many instances, and it may be shown that even for a sheet mill running at so slow a speed as 28 to 30 r.p.m., there are very great advantages in employing a direct coupled motor and flywheel in spite of the high capital cost, which has led to this direct coupled drive being adopted for a number of sheet and tin-plate mills.

Where a high-speed motor is installed, the flywheel should always be coupled to the mill pinions, for it is a bad practice to instal a high speed flywheel coupled to the shaft of the high speed motor, because the stresses due to the power given up by the flywheel are undetermined, as these depend on the rate of deceleration of the flywheel, and if these stresses had to be transmitted through gears, ropes or belts, they either have to be designed with a very large margin of safety, or else they are liable to be unduly stressed and suffer damage. It is always a good principle to couple the flywheel to the mill pinions in as direct a manner as is possible.

To enable the flywheel to assist the motor by giving up some of its stored kinetic energy so as to provide part

of the power required during the passes, provision must be made so that the motor and flywheel fall in speed as the power required increases, that is to say, the motor must be artificially made to decrease in speed to a considerably greater extent than it normally would with an increase in power. This artificial increase of the fall of speed can be obtained by either of two methods:—

(1) By arranging that the speed shall steadily decrease as the power given by the motor increases. Where the mill motor is a direct current motor, this is done by providing the motor with a compound winding, which causes the necessary fall in speed without loss in power.

Where a three-phase mill motor is installed, resistances must be inserted in the rotor-circuit, which cause a definite loss in power as the speed decreases.

(2) By arranging that the speed shall commence to decrease after the motor has reached a predetermined load. This is done by introducing some electro-mechanically operated device, such as a relay, which diminishes the resistance in the shunt field of a direct current mill motor when a predetermined load is reached, or a relay, which in the case of a three-phase motor, increases the resistance in the rotor circuit.

This second method of artificially increasing the fall in speed or slip is often spoken of as automatic slip regulation, but the term "automatic" is a misleading one, because both methods are automatic, and it would be more correct to call the first method "permanent slip regulation", and the second "intermittent slip regulation."

Speed Variation.—In Europe the ordinary three-high merchant mill with roll diameters ranging from 10 in. to 18 in. is required to roll as many different sections as possible to meet the conditions of trade, and the smaller mills have to roll sections from either steel billets, scrap piles or puddled iron bars.

To meet these conditions such mills have to be able to run at a considerable number of different speeds.

It is always desirable to run at as high a speed as possible to get large outputs, but it is not possible to roll large steel billets at as high a speed as small billets, for it would be a physical impossibility for the men to catch a large and heavy steel billet thrown from the first pass of the roughing mill at a high speed.

Iron must be rolled at a much slower speed than steel, for if iron bars are rolled at a high speed they would be torn up and spoiled.

Guide rounds or squares can be rolled at a much higher speed than hand rounds or squares, for where guides can be used they hold the bar in position, but in rolling hand rounds the roller has to hold the bar in position with his tongs, and the speed of rolling must not be faster than he can walk or else he cannot follow up the bar.

The conditions for driving such a mill are very well fulfilled by the direct current compound wound compensated motor, because it can be set to run at any basis speed suitable to the section being rolled by regulating the shunt field, while the compound winding acts as a permanent slip regulator, and gives the necessary fall in speed, without wasting power, to enable the flywheel to give up part of its stored energy to assist the mill motor when required.

When the billet is out of the rolls the mill motor will not run above the basis speed to which it has been set, so that there is no difficulty in entering the next billet.

The three-phase induction motor is not at all well suited for driving such merchant mills, because its speed can only be reduced to that suited to the section being rolled by inserting resistances in the rotor circuit, and

attention has already been called in the three-phase winding engine section of this paper to the great variation of speed which takes place with change of load, when the speed of such a motor is reduced in this way.

Suppose that the mill quoted under example 1 were driven by a three-phase induction motor having a synchronous speed of 250 r.p.m., and, in order to roll large billets, such resistance was inserted in the rotor circuit to bring down the speed to 120 r.p.m. at a definite load. As soon as the bar was out of the rolls the motor would speed up, and, if the interval before the bar was re-entered was at all long, the speed of the motor would be nearly up to 250 r.p.m., so that it would be very difficult to re-enter the bar, and to re-enter a fresh billet at this speed would be almost impossible, as the rolls running at such a high speed would not grip the large billet. A mill driven in this way would be practically unworkable.

Suppose the motor were a 500 h.p. motor, then, if the speed were reduced to this extent, about 250 horse power would be wasted in the resistance if the motor was giving the turning moment corresponding to its full load. Such a three-phase drive is also extremely wasteful.

The most successful method of utilizing three-phase current to drive merchant mills working under such conditions, which has yet been devised, consists in installing a three-phase motor direct coupled to a smaller compound wound direct current motor for driving the mill and providing a rotary converter having its slip-rings connected to the slip-rings of the rotor of the three-phase motor and its commutator connected to the commutator of the direct current motor. When it is desired to run this mill motor combination at speeds below synchronous speed, the power which would otherwise be lost in resistance in the rotor circuit for the three-phase motor is converted from three-phase to direct by the rotary converter and beneficially used in the direct current motor to assist the three-phase motor in driving the mill.

This system is therefore economical and the three machines together behave something like a direct current compound wound motor. That is to say, the mill motor set can be adjusted to run at any basis speed suitable to the section being rolled by regulating the shunt field of the direct current motor, while the compound winding of this direct current motor acts as a permanent slip regulator, giving the necessary fall in speed to allow the flywheel to take effect, without entailing any loss in power.

It will also be seen that, when the bar is out of the rolls, this set will not speed up to the synchronous speed, but will be limited by the basis speed to which the direct current motor has been set. Such variable three-phase sets have been installed for driving 8 or 9 different merchant mills, with very good results, the largest being a 1,300 h.p. set, and it is quite easy to obtain a 3 to 1 speed regulation, economically, in this way, and to get any speed at all, within these limits, while the turning moment which the set can give, increases as the speed is reduced.

Conclusions Concerning Rolling Mills.—The authors are of opinion that direct current is much better adapted for driving mills and machinery in a steel works than three-phase current.

Where large reversing rolling mills are driven electrically, and the motor driving the motor generator set is supplied from a direct current system, it is found that the power supplied to the rolling mill plant can be maintained at a much steadier value than if it is supplied from a three-phase system, and with the direct

current motor about a ten per cent. saving in power can be effected, as there is no loss of power in slip resistances.

With a direct current system the flywheel of the motor generator set can be utilized to a great extent for neutralizing sudden peaks of short duration in the power demand on other parts of the system, for, during such a peak, the motor generator set would not only cease to take power from the supply, but the motor can be actually reversed, and give its full output as a generator returning the energy of the flywheel as electrical energy to the supply system.

With a three-phase system, peaks in other parts of the system cannot be neutralized to anything like the same extent, for the motor can only be made to cease to take power from the supply system and cannot act as a generator returning power to the supply system.

It has been shown that the direct current compound wound motor is very well adapted to fulfil the conditions for driving three-high merchant and bar mills and that considerable complication and difficulties are involved in adapting the three-phase motor for this purpose.

Direct current motors are also particularly well adapted for driving slow speed sheet and tin-plate mills, as it is very easy to provide a slow speed direct coupled motor and gain the advantage and economy of this drive, and, as there is no loss of power in slip resistances, the direct current motor will prove from twelve to 15 per cent. more economical than the three-phase motor on this current alone.

The advantages of direct current table and live roll motors are so fully recognized that they need not be recapitulated here, but it is interesting to note that in perhaps the largest steel works on the American Continent, where the main power supply is three-phase, all the table motors are direct current and a large and costly installation of converting machinery has been provided to convert the three-phase current to direct current to supply these table motors.

It may be argued that the cost of cables with a 500 volt direct current system is much higher than for a high voltage three-phase system, but it must be remembered that a well laid out steel works is comparatively compact and the distances are relatively short, so that the cost of cables is not a very serious item, and that the additional capital cost of three-phase generating plant to produce power, which is wasted in the slip resistance, etc., will pay for a good deal of extra cable.

In steel works where there are blast furnaces and coke ovens, the modern tendency is to instal large gas engines using blast furnace or coke oven gas, both for driving the blast furnace blowers and for generating electrical power, and experience shows that a direct current gas engine power house is cheaper in capital cost and easier to operate than a three-phase power house.

Gas engine driven three-phase alternators present the most difficult problem in parallel running, and while sufficient experience has been gained in the past ten years to enable these difficulties to be overcome by proper design, the provision of very heavy flywheels is always necessary, and these largely increase the capital cost of the three-phase generators, which are intrinsically more expensive than direct current generators.

The higher the periodicity the heavier the flywheels for the three-phase generators become.

In conclusion, the authors wish to express their thanks to the Siemens Company of Canada, Limited, to Messrs. Siemens Brothers Dynamo Works, and to the Siemens Schuckertwerke for the information which they have furnished and for the assistance which they have rendered in the preparation of this paper.

WAGES OF MICHIGAN MINE WORKERS¹

In an investigation carried on by the U. S. Department of Labor last fall, each of the Michigan copper mining companies was requested to state what increases had been made in wages or in contract rates during recent years, back to 1900, if possible. One of the most definite statements was made by the Calumet & Hecla Mining Co., which reported that its wages and rates had been changed as follows: March, 1899, a raise of 10 per cent.; January, 1901, a raise of 2½ per cent.; May, 1907, a raise of 10 per cent.; December, 1907, a cut of 10 per cent.; May, 1912, a raise of 10 per cent. Some of these changes were made by other companies on or about the months mentioned. Practically all of the companies in the district increased wages and contract prices 10 per cent. in May 1912.

Some miners work "on company account" or monthly basis, but many work on a contract basis. Contracts were formerly let on the basis of a cubic fathom of rock mined, but now they are usually let on the basis of tons mined. In no mines is the rock actually weighed, but the pay of contract miners is figured on the number of tramcar loads of rock which they blast out and which the trammers push to the shaft. In each mine the dimensions of the tramcars are the same, but the load, of course, depends on how fully they are filled or how much they are heaped.

The only mine workers that work on contract are miners and trammers. The following table shows the number of miners and trammers working on contract and monthly basis in July, 1913, just before the strike began, and shows which system the mine managers prefer, according to their own statements:

Mine	Miners on—		Trammers on—		Contract basis or shift basis preferred by management.
	Contract basis.	Monthly basis.	Contract basis.	Monthly basis.	
Ahmeek	138	...	75	42	Contract.*
Allouez	79	2	94	2	Do.*
Calumet & Hecla..	652	60	(†)	(‡)	Do.
Copper Range	(†)	(†)	(†)	(‡)	Do.*
Centennial	26	2	17	....	Do.*
Franklin	11	43	....	42	Do.
Hancock . . . . .	....	47	....	29	Shift.
Isle Royale	56	93	....	157	Contract.*
Lake	6	34	....	25	Do.
La Salle . . . . .	....	6	....	(‡)	Do.
Laurium . . . . .	(**)	....	....	(‡)	Do.
Mass . . . . .	....	38	....	31	(§)
Mohawk	225	14	....	126	Contract.
Oneco . . . . .	....	9	....	3	Shift.
Osceola	56	2	....	‡296	Contract.
North Kearsarge . . .	94	2	....	....	Do.*
South Kearsarge . . .	34	42	....	....	Do.*
Quincy	140	500	....	200	Do.*
Superior	22	16	32	....	Do.*
Tamarack	73	38	....	77	Do.
Winona	64	18	....	(‡)	Do.*
Houghton . . . . .	....	(‡)	....	(‡)	Do.*
Wolverine	98	....	....	86	Do.*
Total	‡1,774	a966	b218	d1,116	
Per cent. of total..	64.74	35.36	16.34	83.66	

*When practicable. †Not reported. ‡All on shift basis; number not reported. **All on contract basis; number not reported. §Would have to be determined by trial. ¶North Kearsarge and South Kearsarge included. ¶¶Not including Copper Range and Laurium. aNot including Copper Range and Houghton. bNot including Calumet & Hecla and Copper Range. dNot including Calumet & Hecla, Copper Range, La Salle, Laurium, Winona, and Houghton.

¹Extract from report by Department of Labor, Washington.

Most of the mine managers who prefer the contract system, or prefer it if practicable, state that they prefer it because it gives an efficient miner an opportunity to increase his earnings above the regular monthly rate. Many miners also prefer the contract system because they can earn more by that system than by the ordinary monthly rate. All pay rolls that were examined showed that the average earnings of the miners and trammers on contract were greater than the average earnings of those paid by the month. However, complaints are heard among certain contract miners because during some months their earnings would be unusually low on account of the poor rock mined, or some other run of bad luck. Contract rates are sometimes fixed by the mine captain (foreman), but more generally by him and the superintendent or general manager. Monthly wages are always determined by the management.

Of the total number of miners, 2,740, reported on either contract or monthly basis, 1,774, or 64.74 per cent., were on contract basis, and 966, or 35.26 per cent., on monthly basis. Of the total number of trammers, 1,334 reported on either contract or monthly basis, 218, or 16.34 per cent., were on contract basis, and 1,116, or 83.66 per cent., on monthly basis. Until January 1, 1913 a curious custom prevailed in all of the mines in the Michigan copper range, and it prevails yet in all mines except those of the Calumet & Hecla and its subsidiary companies. Miners that work full five and one-half day shifts or full five-night shifts are paid on the basis of having worked six shifts. Paying miners on this basis is an old Cornish custom imported into Michigan years ago. On January 1, 1913, this custom was modified by the Calumet & Hecla and its subsidiary companies, and these companies have since paid miners on night shifts for only five shifts a week, though they continue to pay miners on day shifts on the basis of having worked six shifts a week. On the same date these companies increased the rate of pay of miners "on company account" 25 cents per shift. In analyzing the tables relating to wages that follow, it is necessary to bear the old Cornish custom in mind.

An examination of the pay rolls of the mining companies involved in the strike of 1913 (except of a few companies having very small mines) was made by agents of the Bureau of Labor Statistics, and, from the figures thus secured, the tables which follow were compiled. These tables relate to the earnings of miners and trammers who together compose about half of the mine workers and who comprised the greater number of mine workers that went out on strike. All earnings shown in these tables are what the employees received after deductions had been made for materials used in the mines, such as powder, caps, fuse, and carbide, but not including deductions for medical attention, aid fund, rent, fuel, etc.

The following table shows the average number and average earnings of miners employed by each company during the 12 months prior to July 1913, in which month the strike began:

**Average Daily Earnings of Michigan Copper Miners,
Year Ending June 30, 1913.**

Mining Company.	Six months ending Dec. 31, 1912.		Six months ending June 30, 1913		Total for Year ending June 30, 1913.	
	Average number of men.	Average earnings per day or shift.	Average number of men.	Average earnings per day or shift.	Average number of men.	Average earnings per day or shift.
No. 1	908	\$3.22	754	\$3.60	831	\$3.35
No. 2	83	2.99	81	3.44	82	3.21
No. 3	158	3.26	120	3.59	139	3.40
No. 4	99	2.77	85	3.03	92	2.89
No. 5	256	2.79	212	3.13	234	2.94
No. 6	178	3.01	137	3.56	158	3.25
No. 7	134	3.24	123	3.37	129	3.30
No. 8	134	2.95	95	3.60	114	3.22
No. 9	51	3.58	47	3.55	49	3.57
No. 10	40	2.75	34	3.49	37	3.09
No. 11	9	3.86	6	3.26	7	3.62
Totals, Nos. 1 to 12 (Calumet & Hecla and subsidiaries)	2,050	3.11	1,695	3.48	1,872	3.28
No. 13	320	2.69	281	2.70	301	2.69
No. 14	200	2.67	186	2.71	193	2.69
No. 15	365	2.67	369	2.68	367	2.68
No. 16	670	2.75	634	2.79	652	2.77
No. 17	308	2.84	253	2.81	281	2.83
No. 18	125	2.83	107	2.86	116	2.84
No. 19	112	2.71	114	2.57	113	2.64
No. 20	106	2.91	100	2.88	103	2.90
No. 21	58	2.49	*55	*2.48	†57	†2.48
No. 22	43	2.98	48	2.66	46	2.81
No. 23	13	2.61	10	2.61	12	2.61
No. 24	36	2.63	39	2.63	38	2.63
Totals, Nos. 13 to 25	2,356	2.74	*2,196	*2.78	†2,279	†2.74
Total all companies	4,406	2.91	*3,891	*3.08	†4,151	†2.98

*5 months; mine idle in May, 1913. †11 months; mine idle in May, 1913.

The average number of miners was found for this table by dividing the total number of shifts worked, as shown on the pay rolls, by the number of shifts that the mine was operated during each six-month period. In each of the tables that follow a similar method was adopted to find the average number of miners and trammers.

The first company shown in the preceding table is the Calumet & Hecla Co., and its subsidiary companies are numbered 2 to 12. Other companies reporting are numbered 13 to 25. The earnings of miners employed during the year by the Calumet & Hecla and subsidiary companies varied from \$2.89 to \$3.62 per shift and averaged \$3.28. The earnings of miners employed during the year by the other companies varied from \$2.48 to \$2.90 per shift and averaged \$2.74. The general average for all companies during the year was \$2.98.

Miners do not work Saturday afternoons, hence in a month of 30 days without holiday they work only 23 shifts. But under the old Cornish custom their shift rate is computed by dividing their monthly rate by 26, because under this custom miners that work 5½-day shifts a week or 5-night shifts a week are counted as having worked 6 shifts. In other words, the monthly rate of "company account" miners is divided by 26 to arrive at the shift rate, and if a miner is absent 1 day one twenty-sixth of his monthly rate is deducted from his pay; if he is absent 2 days, two twenty-sixths of his monthly rate is deducted. If he works an extra shift on overtime work or in a month of 31 days, he is paid one twenty-sixth more than his monthly rate.

The shift rate is thus computed from the monthly rate

by all companies except the Calumet & Hecla and its subsidiary companies. Prior to January 1, 1913, the Calumet and Hecla and its subsidiary companies followed the old Cornish custom, and divided the monthly rate by 26 to obtain the shift rate, but since then they have divided the monthly rate by 24 instead of 26. They did this because they stopped counting night-shift miners, who work 5 shifts a week, as having worked 6 shifts, though they continued to count day-shift miners who work 5½ shifts a week as working 6 shifts. This, in part, explains why the average shift rate of miners of the Calumet & Hecla and subsidiary companies was higher during the first six months of 1913 than it was during the last 6 months of 1912. Another reason given by the company for this increase is the increased amount of contract mining, and still another reason assigned is the increased use of the one-man drill.

It should be understood that there has been no change in the time that miners work. If they work full time they actually work 23 shifts (counting two half shifts on Saturday forenoons as one shift) in a month of 30 days without holidays.

In computing the rate per shift for contract miners, their earnings for the month are divided by the actual number of shifts that they worked, but with the Calumet & Hecla and subsidiary companies Saturday half shifts are counted as full shifts, and with the other companies Saturday half shifts are counted as full shifts, and an extra shift on Saturday night is counted.

The different methods of computing the shift rate should be considered in comparing the rates shown in the table that are paid by the Calumet & Hecla and subsidiary companies with the rates that are paid by the other companies. The rates for the first 6 months in 1913 can be put on an equal basis only by multiplying the shift rates of the Calumet & Hecla and subsidiary companies by 24 and dividing by 26, or by multiplying the shift rates of the other companies, as they appear in the table, by 26 and dividing them by 24.

If the average shown in the table for miners employed by the Calumet & Hecla and subsidiary companies during the first 6 months in 1913, \$3.48 per shift, be multiplied by 24 and divided by 26, the result is \$3.21 per shift, as compared with \$2.78 per shift paid by other companies on the same basis.

If, however, the earnings per shift are calculated on the time actually worked—that is, on the basis of 23 shifts—the average shift rate is increased above that which is shown in the table. Taking the earnings of miners employed by the Calumet & Hecla and subsidiary companies during the first six months of 1913 and multiplying the average shift rate shown in the table by 24 and dividing by 23, the result is \$3.63 per shift instead of \$3.48. Taking the earnings of miners employed by the other companies during the same period and multiplying the average shift rate shown in the table by 26 and dividing by 23, the result is \$3.14 per shift instead of \$2.78.

The following table shows the average number and average earnings of trammers employed by each company during the 12 months prior to July, 1913, in which month the strike began.

Average Daily Earnings of Trammers, Year Ending June 30, 1913.

Mining Company.	Six months ending Dec. 31, 1912.		Six months ending June 30, 1913.		Total for year ending June 30, 1913.	
	Average number of men.	Average earnings per day or shift.	Average number of men.	Average earnings per day or shift.	Average number of men.	Average earnings per day or shift.
No. 1	600	\$2.84	539	\$2.99	570	\$2.91
No. 2	62	2.54	71	2.54	67	2.54
No. 3	138	2.54	132	2.54	135	2.54
No. 4	95	2.54	87	2.54	91	2.54
No. 5	138	2.55	131	2.57	135	2.55
No. 6	132	2.73	115	2.85	124	2.78
No. 7	111	2.75	95	2.76	103	2.75
No. 8	94	2.68	103	2.73	98	2.70
No. 9	48	2.62	30	3.14	39	2.82
No. 10	26	2.61	29	2.70	28	2.66
No. 11 . . . . .	...	...	2	2.46	...	...
No. 12	3	2.53	2	2.46	2	2.50
Totals, Nos. 1 to 12	1,447	2.71	1,336	2.80	1,392	2.75
No. 13	169	2.31	135	2.31	152	2.31
No. 14	77	2.31	72	2.32	74	2.32
No. 15	175	2.31	*143	*2.31	†160	†2.31
No. 16	207	2.51	199	2.51	203	2.51
No. 17	189	2.53	161	2.55	175	2.54
No. 18	103	2.50	94	2.49	98	2.49
No. 19	68	2.20	64	2.40	66	2.30
No. 20	95	2.38	90	2.38	92	2.38
No. 21 . . . . .	...	...	...	...	...	...
No. 22	55	2.31	‡50	‡2.30	**53	**2.30
No. 23	24	2.46	25	2.27	24	2.36
No. 24	4	2.36	3	2.54	3	2.43
No. 25	36	2.31	34	2.31	35	2.31
Totals, Nos. 13 to 25	1,202	2.40	\$1,070	\$2.41	†1,135	†2.40
Total, all companies	2,649	2.57	\$2,406	\$2.63	†2,527	†2.59

*5 months; not including June, 1913. †11 months; not including June, 1913. ‡5 months; mine idle in May, 1913; **11 months; mine idle in May, 1913. ††Including 2 companies reporting for 5 months; ‡Including 2 companies reporting for 11 months.

As the Cornish custom has never been applied to trammers, a simpler explanation can be made of the table that relates to trammers than of the table that relates to miners. The rates per shift are figured on the same basis for all companies. The monthly earnings of contract trammers are divided by the actual number of shifts that they worked, and the monthly wages of "company account" trammers are divided by 26 or 27, since they work, when working full time, 26 shifts in a 30-day month and 27 shifts in a 31-day month, the Saturday shifts, day or night shifts, being two hours shorter than the shifts on other days.

As shown by the table, the earnings of trammers employed during the year by the Calumet & Hecla and subsidiary companies varied from \$2.50 to \$2.91 per shift and averaged \$2.75; the earnings of trammers employed during the year by the other companies varied from \$2.30 to \$2.54, and averaged \$2.40; and the general average for all companies during the year was \$2.59.

From the pay rolls of the various companies agents of the Bureau of Labor Statistics obtained the monthly rates of all miners and trammers working on "company account" during May, 1913, and the earnings and number of shifts worked by each contract miner and trammer during that month. From the data thus secured, the rates per shift were computed, and these rates were classified by amounts, as appears in the following tables, the first of which relates to miners.

Average Earnings per Day or Shift and Average Number and per cent. of Miners Earning Each Classified Amount per Day or Shift in May, 1913.

AVERAGE NUMBER.

Company.	Average number of miners.	Average earnings per day or shift.	Miners earning each classified amount per day or shift.						
			Under \$2.	\$2 and under \$2.50.	\$2.50 and under \$3.	\$3 and under \$3.50.	\$3.50 and under \$4.	\$4 and under \$4.50.	\$4.50 and over.
No. 1	719.3	\$3.54	...	...	46.5	384.7	193.6	72.2	22.3
No. 2	65.9	3.45	...	...	4.1	46.6	5.6	3.7	5.9
No. 3	98.8	3.69	...	...	...	57.0	15.2	15.3	11.2
No. 4	79.4	3.06	...	...	52.2	19.3	3.9	3.9	...
No. 5	197.3	3.15	0.3	0.4	86.9	89.9	9.7	8.2	2.0
No. 6	139.2	3.72	...	...	11.6	61.1	24.2	22.3	20.0
No. 7	108.8	3.39	...	...	16.0	63.8	13.5	4.0	11.4
No. 8	91.0	3.57	...	...	...	4	69.3	11.6	9.8
No. 9	46.6	3.68	...	...	...	4	33.8	1.9	2.7
No. 10	31.9	3.40	...	...	...	...	26.4	3.2	2.2
No. 11 . . . . .	...	...	...	...	...	...	...	...	...
No. 12 . . . . .	...	...	...	...	...	...	...	...	...
Totals, Nos. 1 to 12	1,578.2	3.48	0.3	0.4	218.1	851.9	282.4	134.5	90.4
No. 13	251.2	2.74	...	...	220.2	29.0	2.0	...	...
No. 14	187.8	2.67	...	...	183.9	3.9	...	...	...
No. 15	355.1	2.65	1.3	1.7	327.0	22.6	...	...	...
No. 16	624.6	2.78	...	...	580.6	40.1	3.9	...	...
No. 17	227.1	2.90	...	1.0	168.7	36.1	11.5	8.9	0.9
No. 18	107.1	2.75	...	...	99.7	5.6	1.9	...	...
No. 19	94.0	2.63	...	66.5	11.6	11.9	4.0	...	...
No. 20	89.1	2.85	...	...	70.7	16.0	2.2	0.1	...
No. 21 . . . . .	...	...	...	...	...	...	...	...	...
No. 22	52.3	2.45	...	12.9	39.4	...	...	...	...
No. 23	46.3	2.61	...	...	46.3	...	...	...	...
No. 24	8.1	2.59	...	...	8.1	...	...	...	...
No. 25	40.3	2.50	...	15.7	22.6	2.0	...	...	...
Totals, Nos. 13 to 25	2,083.0	2.73	1.3	97.8	1,778.2	167.2	28.0	9.0	0.9
Total, all companies	3,661.2	3.06	1.6	98.2	1,996.9	1,019.1	310.4	143.5	91.3

PER CENT.

No. 1	719.3	\$3.54	...	...	6.5	53.5	26.9	10.0	3.1
No. 2	65.9	3.45	...	...	6.2	70.7	8.5	5.6	9.0
No. 3	98.8	3.69	...	...	...	57.7	15.4	15.5	11.3
No. 4	79.4	3.06	...	...	65.7	24.3	4.9	4.9	...
No. 5	197.3	3.15	0.2	0.2	44.0	45.6	4.9	4.2	1.0
No. 6	139.2	3.72	...	...	8.3	43.9	17.4	16.0	14.4
No. 7	108.8	3.39	...	...	14.7	58.6	12.4	3.6	10.5
No. 8	91.0	3.57	...	...	...	0.4	76.2	12.7	...
No. 9	46.6	3.68	...	...	...	0.9	72.5	4.1	5.8
No. 10	31.9	3.40	...	...	...	...	82.8	10.0	6.9
No. 11 . . . . .	...	...	...	...	...	...	...	...	...
No. 12 . . . . .	...	...	...	...	...	...	...	...	...
Totals, Nos. 1 to 12	1,578.2	3.48	(*)	(*)	13.8	54.0	17.9	8.5	5.7

No. 13	251.2	2.74	....	....	87.7	11.5	0.8	....	....
No. 14	187.8	2.67	....	....	97.9	2.1	....	....	....
No. 15	351.1	2.65	0.4	0.5	92.1	6.4	0.7	....	....
No. 16	624.6	2.78	....	....	93.0	6.4	0.6	....	....
No. 17	227.1	2.70	....	0.4	74.3	15.9	5.1	3.9	0.4
No. 18	107.1	2.75	....	....	93.1	5.2	1.8	....	....
No. 19	94.0	2.63	....	70.7	12.3	12.7	4.3	....	....
No. 20	89.1	2.85	....	....	79.3	18.0	2.5	0.1	....
No. 21	....	....	....	....	....	....	....	....	....
No. 22	52.3	2.45	....	24.7	75.3	....	....	....	....
No. 23	46.3	2.61	....	....	100.0	....	....	....	....
No. 24	8.1	2.59	....	....	100.0	....	....	....	....
No. 25	40.3	2.50	....	39.0	56.1	5.0	....	....	....
Total, Nos. 13 to 25	2,083.0	2.73	0.1	4.7	85.4	8.0	1.3	0.4	(*)
Total, all companies	3,661.2	3.06	(*)	2.7	54.5	27.8	8.5	3.9	2.5

*Less than one-tenth of 1 per cent.

As appears by the second part of the table, 54 per cent. of the miners in the mines of the Calumet & Hecla and subsidiary companies earned from \$3 to \$3.50 per shift, and 85.4 per cent. of the miners in the mines of the other companies earned from \$2.50 to \$3 per shift. The average rate per shift for miners was \$3.48 in the mines of the Calumet & Hecla and subsidiary companies and \$2.73 in the mines of the other companies. It should be understood, however, that the rate per shift was found by dividing the monthly rates or earnings by 25 in the case of the Calumet & Hecla and subsidiary companies and by 27 in the case of other companies. As previously explained, the division is made by 25 for the former companies and by

27 for the latter companies because May was a month of 31 days. In a month of 30 days the division is made by 24 and 26, respectively.

To reduce the average shift rate of miners for the Calumet & Hecla and subsidiary companies to the same basis as the average rate for the other companies, the average rate of the former, \$3.48, must be multiplied by 25 and divided by 27. This results in \$3.22 as compared with the average shift rate of the other companies than the Calumet & Hecla and subsidiary companies, which is \$2.73, figured on the 27 shift a month basis.

Following is a table relating to trammers, similar in form to that relating to miners:

Average Earnings per Day or Shift and Average Number and Per Cent. of Trammers Earning Each Classified Amount Per Day Shift in May, 1913.

Company	Average number of trammers.	Average earnings per day or shift.	AVERAGE NUMBER.						
			Trammers earning each classified amount per day or shift.						
			Under \$2.	\$2 and under \$2.50.	\$2.50 and under \$3.	\$3 and under \$3.50.	\$3.50 and under \$4.	\$4 and under \$4.50.	\$4.50 and over.
No. 1	502.8	\$3.08	0.2	31.5	240.3	115.7	100.8	14.1	0.1
No. 2	64.6	2.54	....	....	64.6	....	....	....	....
No. 3	150.6	2.54	....	....	150.6	....	....	....	....
No. 4	99.9	2.54	....	....	99.9	....	....	....	....
No. 5	127.8	2.55	....	....	127.8	....	....	....	....
No. 6	120.1	2.93	....	3	75.1	24.7	15.4	1.1	3.6
No. 7	75.7	2.81	....	....	75.7	....	....	....	....
No. 8	104.7	2.68	....	....	89.7	15.0	....	....	....
No. 9	29.6	3.17	....	2	8.3	17.5	3.6	....	....
No. 10	23.9	2.76	....	....	17.2	6.1	0.6	....	....
No. 11	....	....	....	....	....	....	....	....	....
No. 12	....	....	....	....	....	....	....	....	....
Totals, Nos. 1 to 12	1,299.7	2.83	0.2	32.0	949.2	179.0	120.4	15.2	3.7
No. 13	134.0	2.31	....	134.0	....	....	....	....	....
No. 14	68.6	2.33	....	68.6	....	....	....	....	....
No. 15	140.0	2.31	....	140.0	....	....	....	....	....
No. 16	174.0	2.53	....	5.2	168.8	....	....	....	....
No. 17	133.9	2.53	....	2.7	131.2	....	....	....	....
No. 18	80.3	2.48	....	5.0	75.3	....	....	....	....
No. 19	59.0	2.38	....	55.7	3.3	....	....	....	....
No. 20	72.7	2.38	....	72.7	....	....	....	....	....
No. 21	....	....	....	....	....	....	....	....	....
No. 22	51.9	2.30	....	51.9	....	....	....	....	....
No. 23	23.6	2.23	....	23.6	....	....	....	....	....
No. 24	2.2	2.62	....	....	2.2	....	....	....	....
No. 25	72.7	2.29	....	72.4	0.3	....	....	....	....
Totals, Nos. 13 to 25	1,012.9	2.40	....	631.8	381.1	....	....	....	....
Total, all companies	2,312.6	2.64	0.2	663.8	1,330.3	179.0	120.4	15.2	3.7
			PER CENT.						
No. 1	502.8	\$3.08	(*)	6.3	47.8	23.0	20.0	2.8	(*)
No. 2	64.6	2.54	....	....	100.0	....	....	....	....
No. 3	150.6	2.54	....	....	100.0	....	....	....	....
No. 4	99.9	2.54	....	....	100.0	....	....	....	....
No. 5	127.8	2.55	....	....	100.0	....	....	....	....
No. 6	120.1	2.93	....	0.2	62.5	20.6	12.8	0.9	3.0
No. 7	75.7	2.81	....	....	100.0	....	....	....	....
No. 8	104.7	2.68	....	....	85.7	14.3	....	....	....
No. 9	29.6	3.17	....	0.7	28.0	59.1	12.2	....	....
No. 10	23.9	2.76	....	....	72.0	25.5	2.5	....	....
No. 11	....	....	....	....	....	....	....	....	....
No. 12	....	....	....	....	....	....	....	....	....
Totals, Nos. 1 to 12	1,299.7	2.83	(*)	2.3	73.0	13.8	9.3	1.2	0.3

Average Earnings per Day or Shift and Average Number and Per Cent. of Trammers Earning Each Classified Amount Per Day or Shift in May, 1913.—Continued.

Company	Average number of trammers.	Average earnings per day or shift.	Trammers earning each classified amount per day or shift.						
			Under \$2.	\$2 and under \$2.50.	\$2.50 and under \$3.	\$3 and under \$3.50.	\$3.50 and under \$4.	\$4 and under \$4.50.	\$4.50 and over.
No. 13	134.0	2.31	....	100.0	....	....	....	....	....
No. 14	68.6	2.33	....	100.0	....	....	....	....	....
No. 15	140.0	2.31	....	100.0	....	....	....	....	....
No. 16	174.0	2.53	....	3.0	97.0	....	....	....	....
No. 17	133.9	2.53	....	2.0	98.0	....	....	....	....
No. 18	80.3	2.48	....	6.2	93.8	....	....	....	....
No. 19	59.0	2.38	....	94.4	5.6	....	....	....	....
No. 20	72.7	2.38	....	100.0	....	....	....	....	....
No. 21 . . . . .	....	....	....	....	....	....	....	....	....
No. 22	51.9	2.30	....	100.0	....	....	....	....	....
No. 23	23.6	2.23	....	100.0	....	....	....	....	....
No. 24	2.2	2.62	....	....	100.0	....	....	....	....
No. 25	72.7	2.29	....	99.6	0.4	....	....	....	....
Total, Nos. 13 to 25	1,012.9	2.40	....	62.4	37.6	....	....	....	....
Total, all companies ..	2,312.6	2.64	(*)	28.7	57.5	7.7	5.2	0.7	0.2

*Less than one-tenth of 1 per cent.

As appears by the second part of this table, 73 per cent. of the trammers in the mines of the Calumet & Hecla and subsidiary companies earned from \$2.50 to \$3 per shift and 62.4 per cent. of the trammers in the mines of the other companies earned from \$2 to \$2.50 per shift.

The average rate per shift of the trammers employed by the Calumet and Hecla and subsidiary companies appears as \$2.83, and the average of trammers employed by other companies appears as \$2.40, and both averages are figured on the same basis, that is, by dividing the monthly wages of "company account" trammers by 27 and dividing the earnings of contract trammers for the month by the number of shifts that they actually worked.

BOOK REVIEWS

MINE SAMPLING AND VALUING, by C. S. Herzig, with a Chapter on Sampling Placer Deposits by C. W. Purington—Mining and Scientific Press and The Mining Magazine—Price \$2.00—For sale by Book Department, Canadian Mining Journal.

This book has been written to cover a field which has not received the attention in mining literature that it deserves. Many articles have been written on the subject, but this is the first pretentious work which has appeared since the publication of Mr. T. A. Rickard's book, "The Sampling and Estimation of Ore in a Mine."

The first part of the work, entitled Mine Sampling, deals with principles underlying mine sampling and valuing, pick analysis, instruments used, general methods, precautions necessary, geological factors, churn drilling, handling of samples, preparation of samples for assay, and assaying.

The second part, entitled Mine Valuing, deals with estimation of ore, ore in sight, calculation of profits, amortization of capital, writing reports, salting, prospects, special cases, specific gravity, and placer deposits.

The book should prove useful to all who are interested in mine sampling and valuation. It contains many hints that will be of value to the experienced man as well as to the beginner. In part it is very elementary and should prove useful to students as well as to those who are already familiar with the work.

As is not uncommon among mining engineers of a certain class, the author professes to believe that

geology is of no economic importance in mining. He says: "The work of the geologist deals not at all with the commercial aspect, but with the results of cause and effect." This ridiculous statement is, however, contradicted by his later references to the importance of determining the structural features of the ore bodies and enclosing rocks. The chapter on geological factors indicates clearly that the author has some very peculiar notions about the work of mining geologists and of geology in general.

In the next there are some strange misstatements of fact. On page 106 the author says: "Despite the fact that the Calumet and Hecla lode has been worked for a number of miles on its strike and for more than two miles on the dip, with value throughout, the deep shafts of the Tamarack Company, sunk to depths of over 5,000 ft. vertically, in order to work the deeper portions of this deposit, have been unprofitable." As a matter of fact, the Calumet and Hecla lode has been worked profitably for only about two miles on its strike; it has in no place, either at the Calumet and Hecla or Tamarack, been worked for a depth of two miles on its dip, and it had not value throughout.

The Tamarack Mining Co., as the result of exploration by the very methods which Mr. Herzig describes, was enabled to mine profitably a very large portion of the Calumet lode, and paid \$9,420,000 in dividends. A number of shafts were sunk. Some were profitable and some were not. The mining work at great depth depends now very largely for profit or loss on labor conditions, and the price of copper. The future labor conditions and the future price of copper are among the most important things to be considered in the valuation of the mine. We submit that cost of mining and selling price of the product might have been given more consideration in a book on mine valuation.—R. E. H.

PRACTICAL INSTRUCTIONS IN THE SEARCH FOR AND THE DETERMINATION OF USEFUL MINERALS AND RARE ORES—By Alex. McLeod—John Wiley & Son, New York—For sale by Renouf Publishing Co., 25 McGill College Avenue, Montreal.

The aim of this little book is to furnish very simple means for the determination of useful minerals. Simple tests, which enable the novice to recognize minerals are given.

The introductory portion is devoted to information concerning the prospector's pan, hardness and streak of minerals, prospecting hints, preliminary tests, surface changes, surface indications, apparatus and chemicals required for testing and hints on testing.

Methods of testing are described, and eleven tables are given, in which the minerals are classed according to easily determined characteristics. A feature is the statement of the tests which are most useful in distinguishing minerals which resemble one another.

DETAILS OF CYANIDE PRACTICE, by **Herbert A. Megraw**, McGraw Hill Book Co.—1914—Price \$2.00
—For sale by Book Department, Canadian Mining Journal.

This book is made up of a series of articles written by Mr. Megraw after visiting cyanide plants in various parts of Canada and United States. It contains articles on the Cobalt district, including a description of the Nipissing high grade mill, by Mr. R. B. Watson, and comments on the practice, by Mr. Megraw. There are chapters devoted to the Hollinger and Dome mills at Porcupine. Other chapters deal with practice in the Black Hills, South Dakota; Telluride, Colo.; Cripple Creek, Colo.; Tonopah, Nevada; Grass Valley, California; Black Oak plant, California; the Gold Road mill, Arizona; two other Arizona mills, and the Nevada Wonder mill.

One chapter is entitled, Continuous Decantation of Slime.

The series of articles is a very interesting one, and metallurgists will find the material very well put together in this book of 211 pages.

Mr. Megraw in his articles has considered description as of less importance than discussion and correlation of facts gathered from widely different places. He has endeavored to present facts and personal opinions, in a form calculated to inform the profession in general, and to promote discussion respecting details involving diverging practice.

PERSONAL AND GENERAL

Mr. H. D. Conant, superintendent of the Lake Superior smelting works, has been appointed superintendent of the Calumet and Hecla Mining Co.'s smeltery at Hubbel, Mich.

Mr. J. B. Tyrrell has returned to Toronto after visiting gold mines in the Porcupine district.

Dr. J. M. Bell was recently at Porcupine.

Mr. F. F. Combemale, of Paris, is in Toronto. Mr. Combemale is interested in gold mines in Venezuela.

Mr. H. H. Lavery has returned from El Callao, South America, where he has been for some months assisting in the examination of mining properties.

Mr. H. P. DePencier was at the Dome mine, South Porcupine, last week.

Mr. Walter H. Aldridge, of New York City, formerly managing director of the Consolidated Mining and Smelting Company of Canada, Ltd., was married to Miss Maud Miller at Oakland, California, on March 18. Mr. and Mrs. Aldridge will reside at New Rochelle, N.Y.

Mr. J. J. Anderson, patentee of an oil-fired smelting furnace, which two or three years ago, at Van Anda, Texada island B.C., was successfully demonstrated by Mr. Thomas Kiddie, to be workable in smelting copper ores, has been at Chewelah, Washington, where the United Copper Co. is putting in a small reduction plant.

Mr. E. D. Black, of Coleman, Alberta, has resigned as pit boss in the York district of the International Coal and Coke Co.'s mines, to become inspector of mines in the Yellowhead Pass district, also in Alberta.

Mr. F. J. Crossland, of Vancouver, B.C., on March 30, read a paper, on oil seepages in British Columbia,

before the local Chamber of Mines. Incidentally, he stated that he had it on the best of authority that the Canadian Government will this season send a corps of experts to British Columbia to conduct careful examinations, so that possible oil fields in that Province may be delimited.

Mr. J. J. Fingland, of Kaslo, B.C., who a few weeks ago was appointed assistant assayer in connection with the experiments in electric smelting of lead-zinc ores at Nelson, B.C., has been appointed by the Provincial Government road superintendent for the Kaslo riding.

Mr. Chas. R. Hamilton, K.C., of Nelson, B.C., last month heard evidence against and for T. Wilson, pit boss at the Crow's Nest Pass Coal Co.'s Coal Creek colliery, in Southeast Kootenay, B.C., in connection with the charge made against him by the Provincial Department of Mines of negligence in the discharge of his duties. The case arose out of the death of a man in one of the mines of the colliery, which resulted from a rope breaking, letting a car run away, the car striking the man and killing him. The neglect of duty charged was in permitting the use of a rope originally six strands, but of which two had been removed. The commissioner reserved judgment until he could carefully consider the evidence taken during the two days over which the enquiry extended.

Mr. Robert R. Hedley was at Tassoo harbor, Moresby island, of the Queen Charlotte group, British Columbia, recently in connection with shipment of several hundred tons of copper ore by the Tassoo Syndicate, of which Mr. Hedley is president. The ore was shipped to the smelting works at Tacoma, Washington.

Mr. Percy F. Horton, superintendent of the H. B. lead mine, near Salmo, B.C., was married last month to Miss Minnie Belle Price at St. Louis, Mo.

Mr. R. W. M. Hunter, finding the snow still too deep to admit of development being resumed just yet at the Pingree mine, in Nelson mining division, B.C., returned to Victoria until conditions shall be favorable for working on the property.

Mr. I. F. Laucks, of Falkenberg & Laucks, Seattle, Wash., is at the Standard Silver-Lead Mining Co.'s concentrating mill at Silverton, Slocan lake, B.C., with the object of devising a means of lessening metal losses there.

Mr. Nordegge has been on a business visit to Vancouver island, B.C.

Mr. Bruce R. Ritchie, of the engineering staff of the Consolidated Mining and Smelting Company of Canada, Ltd., has returned to Kootenay, B.C., from a visit to Montreal, Quebec.

Mr. J. M. Ruffner, general manager of the North Columbia Gold Mining Co., operating extensively in Atlin camp, is back in British Columbia, after having spent the latter part of the winter at his home in Cincinnati, Ohio.

Mr. Chas. F. Sherwin, of Riondel, Kootenay lake, B.C., superintendent of the New Canadian Metal Co.'s Bluebell lead mine, went to Minnesota last month to spend a vacation there.

Mr. Chas. Simpkins, of Coeur d'Alene, Idaho, is now superintendent for the Florence Mining Co., of Spokane, Wash., at its group of mineral claims in Ainsworth mining division, B.C.

Mr. R. J. Spry, superintendent of the British Columbia Copper Co.'s Eureka mine, near Nelson, B.C., has returned to that city after having been on a visit to London, Ont.

Mr. F. M. Sylvester, of Vancouver, B.C., general manager for the Granby Consolidated M. S. and P. Co., Ltd., was at Anyox, Observatory inlet, last month, about

the time smelting was begun at the company's smeltery there.

Mr. Frederic R. Weekes, of New York City, consulting engineer to the British Columbia Copper Co., has lately been visiting the company's mines in British Columbia in company with Mr. Frederic Keffer, the company's resident engineer and geologist.

Mr. Roy Wethered, late superintendent of the Consolidated Mining and Smelting Co.'s mines in Ainsworth camp, British Columbia, has gone to the southern part of the United States on a holiday trip.

Mr. W. P. Williams, of Blairmore, Alberta, has been appointed superintendent of the Bellevue colliery of the West Canadian Collieries, Ltd., which operates several collieries in the Blairmore-Frank district.

Mr. W. R. Wilson, of Fernie, B.C., general manager for the Crow's Nest Pass Coal Co., was in Toronto last month.

OBITUARY.

Capt. James Morrish, who in the nineties was manager of the Velvet mine, a few miles from Rossland, B.C., died recently in Cornwall, England.

The Herbert Morris Crane & Hoist Co. has published bulletin B3, describing travelling lifting gears.

The Siemens Company of Canada has received an order from the Canadian Ingersoll Rand Co. for two 380 h.p. 3-phase, 2,200 volt, 60 cycle, 146 r.p.m. induction motors of the slip ring type, provided with short-circuiting and brush-lifting device, together with two Siemens' liquid starters and cast iron mining pillars for the Acadia Coal Co., Nova Scotia. These motors are to be used for driving air compressors. Some time ago the Siemens Co. equipped the sub-station and supplied a large number of motors, cables and transformers.

The Siemens Company of Canada has received an order for 5 sets of 12,000 volt switching apparatus with three tank oil switches, panels, etc., for the Canada Cement Co. Also for 4 sets of lightning arresters, each set to consist of three horn gaps, triple pole oil immersed damping resistance, Siemens special triple pole choke coil, together with disconnecting switches.

The Smart-Turner Machine Co., Limited, Hamilton, Ont., are supplying The Deloro Mining & Reduction Co., Deloro, Ont., with one of their power vacuum pumps.

SPECIAL CORRESPONDENCE

BRITISH COLUMBIA

Dividends declared during the quarter ended March 31 by metalliferous mining companies operating in British Columbia amount to \$551,066, as follows: Consolidated Mining and Smelting Company of Canada, Ltd., \$116,088; Granby Consolidated Mining, Smelting, and Power Co., Ltd., \$224,978; Hedley Gold Mining Company, \$60,000; Standard Silver-Lead Mining Company, Ltd., \$150,000. The Canadian Gold Fields Syndicate, Ltd., has declared a dividend and bonus, together at the rate of two-and-a-half per cent., payable on April 15, but as this will simply be a redistribution of the portion of the Consolidated Co.'s dividend on shares in that company owned by the syndicate, it is not taken into account.

With the exception of where winter conditions pre-

vent mining being carried on to advantage while the snow lies deep, and of a restricted total output of coal at Vancouver Island mines consequent upon the reduced demand for island coal, following last year's strike of coal miners, the situation in the productive mining camps of the Province is about normal. Enthusiasts have recently given opinions at public meetings to the effect that production will be much larger this year than in 1913 and dividend payments will be nearly doubled, but it will most likely be found that such sanguine forecasts were not warranted. It is true that a substantial addition to production may be expected in the Coast district, the Granby Co. having commenced to smelt copper ore at its new works at Granby bay, Observatory inlet, and two or three small producers having lately been placed on the shipping list, while the Britannia will probably make a larger output this year than last. In addition, there are two or three lodemines about Hazelton now shipping ore that were not similarly productive in 1913. Speaking generally, though, there is as yet little to warrant the expectation of any considerable increase in the quantity and value of mineral production in 1914 as compared with last year.

East Kootenay.

The St. Eugene lead mine in small degree and the Sullivan group to a very much larger extent, are continuing to ship ore to Trail. The output of the first-mentioned mine during the first quarter of the year has been less than 300 tons; that of the latter property has exceeded 4,000 tons. Prospecting in search of other ore bodies is being kept up in the St. Eugene, and it is hoped that success will eventually result. The Sullivan has considerable reserves of lead ore, and still larger quantities of lead-zinc ore available for extraction whenever it shall be practicable to also mine the latter.

Production of coal is being fairly well maintained at Crownsnest district collieries on the British Columbia side of the Rocky Mountain divide, but on the Alberta side conditions have been less favorable during recent months. Of the three coal-mining companies operating in Southeast Kootenay, the Hosmer Mines, Ltd., is reported to have been doing best latterly. The Crow's Nest Pass Coal Co. is working both its Michel and Coal Creek collieries, though not always at full time. The Corbin Coal and Coke Co., with unusually large deposits of coal, both underground and outcropping at the surface, is preparing for enlarged operations as soon as the snow shall melt.

West Kootenay.

In Ainsworth, Slocan, Nelson, and Trail Creek (Rossland) divisions of West Kootenay district there has been general activity during the first three months of the year, though here and there a temporary suspension of operations for two or three months, or in some instances for a shorter time, has been found necessary pending a reopening of roads or trails and passing of danger from snowslides.

Ainsworth and Slocan.

Ainsworth division has made a good showing for the first quarter of the year, with a total output of nearly 5,000 tons of ore and concentrates shipped to Trail. The quantity of ore mined was much larger, for both the Bluebell and Highland concentrate their ore. The Maestro is having more ore hauled to the lakeside for shipment; the Silver Hoard will again be shipping as

soon as the wagon-road shall be sufficiently dry to admit of heavy hauling; the Florence will soon be a shipper, development work having opened sufficient ore to allow of production being commenced; and the Utica will ere long again have transportation facilities.

Ore Receipts at Trail, B.C.

Ore receipts (including concentrates) at the Consolidated Mining and Smelting Co.'s smelting works at Trail, British Columbia, during 12 weeks of the current year, to March 26, are shown in the following table. It will be noted that rather better than seven-tenths of the ore was from mines either owned, or operated under option of purchase, by the company:

District and Mine.	From Co.'s Custom		Total Tons.
	Mines. Tons.	Ore. Tons.	
East Kootenay—			
St. Eugene	246	....	....
Sullivan Group	4,202	....	4,448
Ainsworth—			
Bluebell . . . . .	....	1,876	....
Highland	1,169	....	....
Maestro	138	....	....
No. 1	1,615	....	....
Silver Hoard . . . . .	....	44	....
Slocan—			
Black Prince . . . . .	....	10	....
Cinderella . . . . .	....	14	....
Colonial . . . . .	....	23	....
Eastmont . . . . .	....	82	....
Lone Bachelor . . . . .	....	40	....
Neepawa . . . . .	....	4	....
Ottawa	147	....	....
Rambler-Cariboo . . . . .	....	307	....
Richmond-Eureka	136	....	....
Ruth . . . . .	....	182	....
Slocan Star . . . . .	....	382	....
Standard . . . . .	....	3,857	....
Surprise . . . . .	....	201	....
Van-Roi . . . . .	....	320	....
			5,705
Nelson—			
Emerald . . . . .	....	735	....
H. B. . . . .	....	1,194	....
Molly Gibson	71	....	....
Queen . . . . .	....	69	....
Revell . . . . .	....	9	....
Silver King	4,417	....	....
Second Relief . . . . .	....	25	....
Yankee Girl . . . . .	....	230	....
Zincton . . . . .	....	293	....
			7,043
Rossland—			
Blue Bird . . . . .	....	38	....
Centre Star Group	37,698	....	....
Josie (Le Roi No. 2, Ltd.) . . . . .	....	4,370	....
Le Roi	14,788	....	....
			56,894
Boundary—			
Sally . . . . .	....	26	....
Union . . . . .	....	66	....
			92
Skeena—			
American Boy . . . . .	....	24	....
Silver Standard . . . . .	....	758	....
			782
State of Washington (U.S.A.)—			
Ben Hur . . . . .	....	4,170	....
Bonanza . . . . .	....	83	....
Hope . . . . .	....	116	....
Imperator-Quillp . . . . .	....	365	....
Iron Creek . . . . .	....	18	....
Knob Hill . . . . .	....	717	....
Silver Union . . . . .	....	9	....
			5,478
Totals	64,627	20,657	85,284

It should be kept in mind that the 79,806 tons shown as above as from British Columbia mines (the remaining 5,478 tons of United States ore being the difference between this quantity and the total of 85,284 tons) by no means indicates the total quantity of ore produced in the several districts from which the smelting works at Trail draws its supplies, but only the quantity sent to the Consolidated Co.'s smeltery. Much of the Slocan ore is concentrated, that sent to Trail being either first-class ore shipped crude or silver-lead concentrates, in addition to which latter there is much silver-zinc concentrate which is shipped to United States zinc reduction works. Then, only a very small proportion of the copper ore mined goes to Trail, Boundary district smelting works treating more than 5,000 tons a day and Coast

district mines shipping to Tacoma, Washington. Further, much gold ore is crushed and treated in stamp-mills and only a part of the product, in the shape of concentrates caught on the tables and vanners, is sent to Trail for reduction.

Slocan.

Rambler-Cariboo.—In Slocan, the Rambler-Cariboo mine and mill have been affected by a shortage of water, but it is expected this difficulty will be removed with the melting of the snow. About Sandon, danger from snow slides has caused a cessation of work for some weeks at the Richmond-Eureka, but other mines in the neighborhood have been operated throughout the winter. Good progress is reported from the Slocan Star, where preparations are being made to start the concentrating mill after years of inactivity, so far as that part of the enterprise is concerned, all ore shipped during recent years having been sent out crude.

The Surprise has been the only shipper from the floody part of the district during recent months, but underground development has been in progress at the Noble Five, and lately development work was resumed on the Noonday.

About Slocan lake, the most activity has been at mines in the neighborhood of Silverton, namely, the Standard, Van Roi, the Silverton Mines, Ltd., Hewitt-Lorna Doone group, and the Lucky Thought, the last-mentioned being under option of purchase to the Consolidated Mining and Smelting Co. Of these mines, the Standard is the most important by far, its proportion of 5,705 tons of ore and concentrate shipped from the whole of the Slocan district in 1914, to March 26, having been 3,875 tons. The Mineral Separation American Syndicate has been experimenting with its flotation process at the concentrating mill of the Silverton Mines, Ltd., and it is reported that results have been satisfactory since Hardinge conical mills were put in and finer grinding thus provided for.

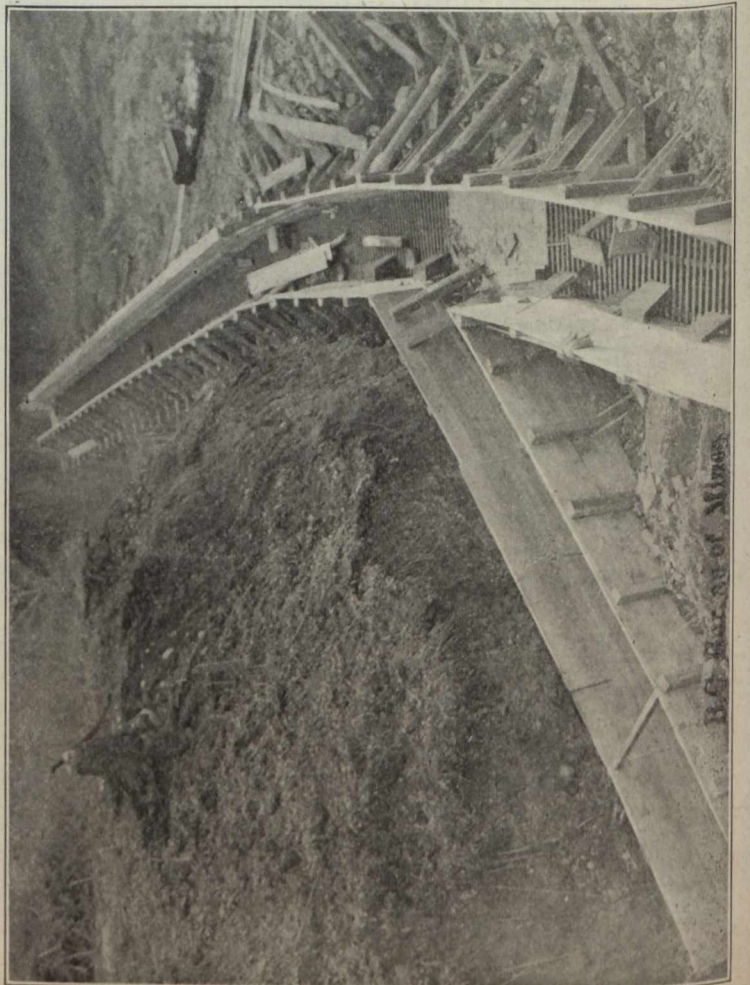
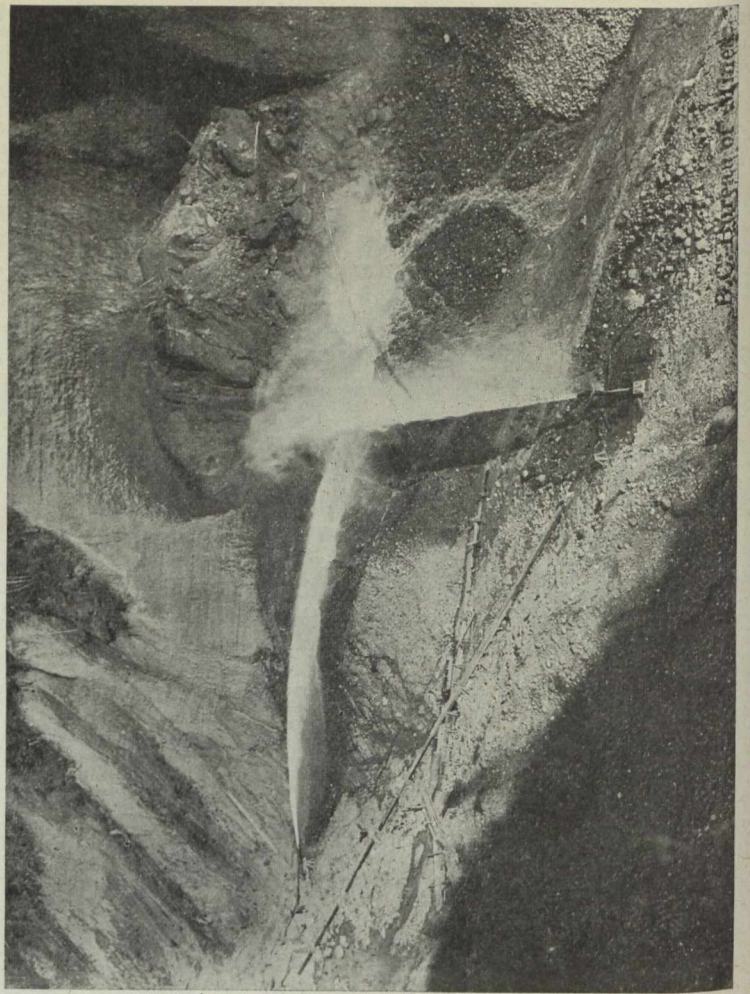
The Van-Roi Mining Co. has sent out from its office in London, England, the report for the month of February, received from the managers of its silver-lead-zinc mine and concentrating mill in Silverton camp. The mill report shows that the total amount crushed during the month was 2,269 tons of ore, of an average assay of silver 15.5 oz. to the ton, lead 2.1 per cent., and zinc 6.3 per cent. The mill was operated 510 hours. The product was 90 tons of lead concentrate, having an average assay value of silver 222.2 oz. to the ton, lead, 57 per cent., and zinc 13.8 per cent.; and 150 tons of zinc concentrate, assaying silver 59.3 oz. to the ton, lead 2.2 per cent., and zinc 40.6 per cent. The total approximate value of the mill products was \$15,776. The expenditure during the month was: On development \$21,120, ore-production \$5,983, milling \$3,277, capital and other expenditure \$1,349; total \$12,729. The balance to credit was \$3,047. Beside ore production, there was done in mine 190 ft. of new development work.

In Slocan City division, shipments this year have been as follows: Black Prince 10 tons, Eastmont 82 tons, Neepawa 4 tons, Ottawa 147 tons; total 243 tons.

Lately it was reported that a 6 in. stringer of high grade silver ore had been cut in a crosscut adit, being driven from the lower workings of the Black Prince to cut the Two Friends vein, which is estimated to be 25 ft. farther ahead.

Nelson Mining Division.

Snow is melting so quickly on the lower slopes of the mountains that the prospecting season has opened earlier this year than usual. Already a number of



B.C. Bureau of Mines

B.C. Bureau of Mines

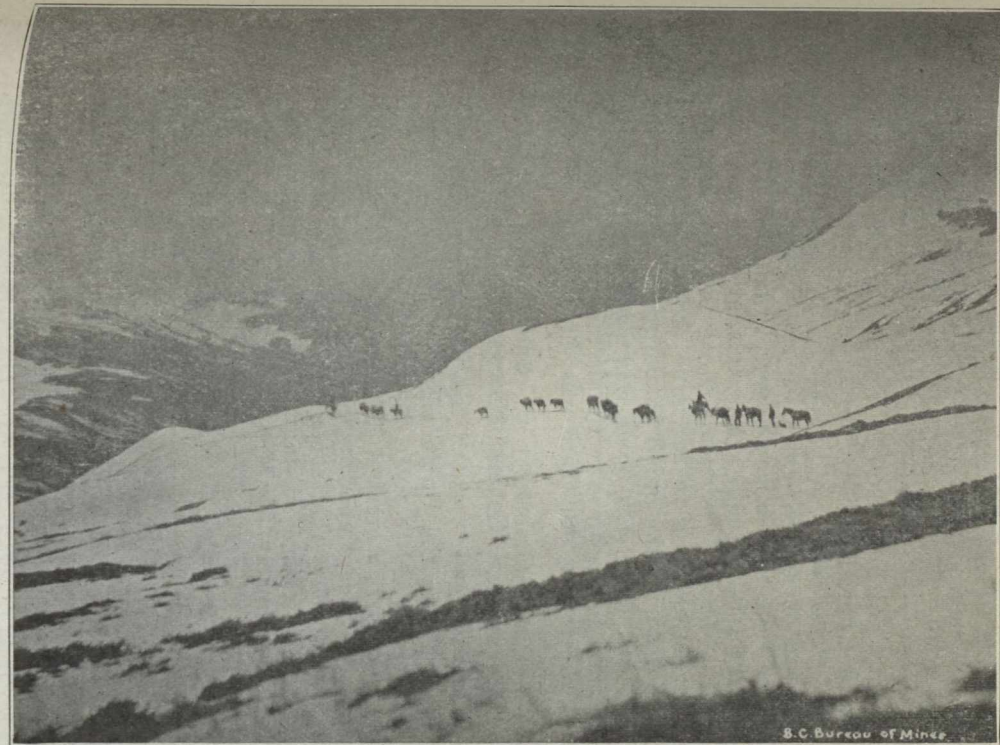
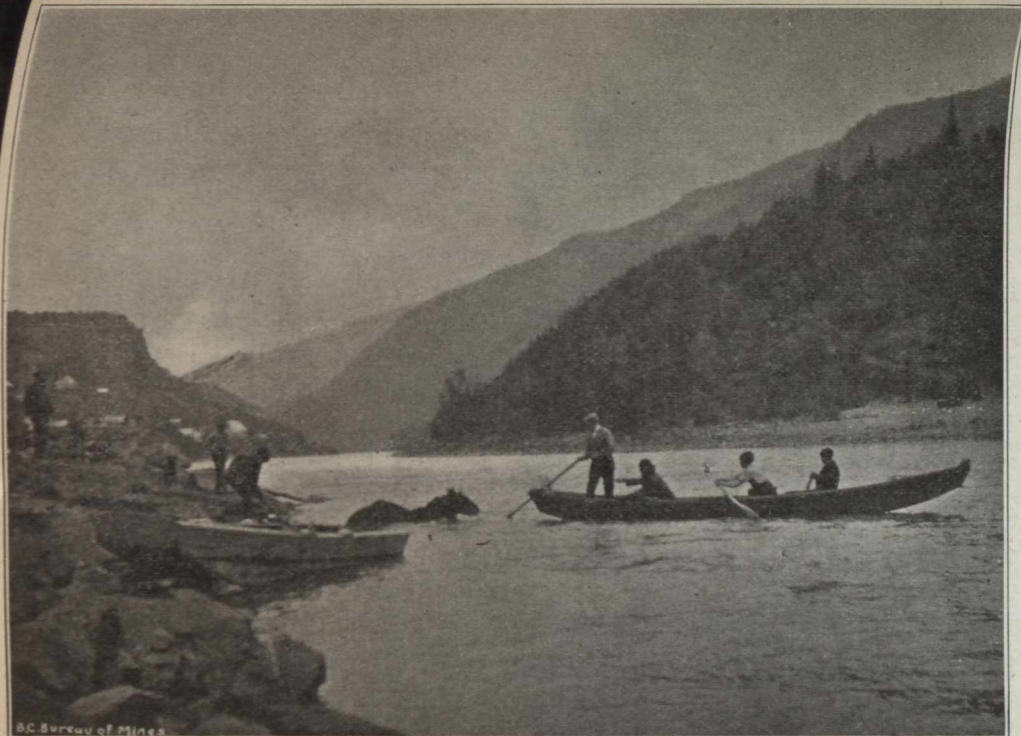
B.C. Bureau of Mines

B.C. Bureau of Mines

General View and Monitors

Quesnelle Hydraulic Gold Mining Co.—Quesnel River, B.C.

Sluiceway



Swimming Pack-train across Stikine at Telegraph Creek
Opening Hydraulic Pit, Boulder Creek Mining Co.

Scenes in British Columbia

Groundhog Mt.—Trail over Summit in Midsummer.
Fraser River—at "53 Mile" of Grand Trunk Pacific

mineral claims have been staked in Nelson and Sheep Creek districts.

Development work is to be resumed shortly at both the Eureka and Pingree mining properties, situated in the mountains west of Nelson City. The British Columbia Copper Co., before suspending for the winter operations on the Eureka, developed sufficient ore to warrant a beginning being made to stope for shipment to the company's smelting works at Greenwood, Boundary district, but production cannot be undertaken to advantage until after provision shall have been made for transporting the ore to the railway. It is intended to construct an aerial tramway, the material for which is stored at Granite, several miles from the mine. On completion of this work in the spring stoping operations will be begun and development work resumed. The company's engineers report a probable tonnage developed thus far of about 20,000 tons of ore, having an average value in gold, silver and copper contents of \$7 a ton. Native silver has been found to occur in places in the mine. On the Pingree an adit has been driven more than 200 ft., and the face of this working is stated to be well mineralized. Further development of this mine will be under the direction of Mr. R. W. M. Hunter, of Victoria.

A local syndicate has been formed to carry on placer mining on Forty Nine Creek, a few miles west of Nelson, and lumber for a flume has been ordered. It is stated that the syndicate has obtained control of placer leases covering four miles of ground on the creek. In early years placer miners worked successfully on the creek and obtained gold to a considerable total value.

It is announced that local men, who have during the last two years obtained many assays of materials stated to contain platinum, are now putting in a plant to have a treatment capacity of one ton a day. It is claimed that a London metallurgist has been working on the platinum problem in Nelson for some months, and that he is now supervising the erection of the plant, and "is employing the method used in Russia to secure the platinum value." One of the most active members of the syndicate is quoted as follows: "We will shortly have in operation a small plant to demonstrate that platinum exists in commercial quantity. We have spent a large sum of money on investigating the problem, and have sent samples of rock to assayers in many parts of the world. We have never attempted to sell anything. Our investigations have been carried on quietly and with the object of demonstrating that in the future the platinum industry is likely to prove of tremendous importance to the Nelson district."

Trail Creek Mining Division.

Rossland mines are the only ones in this division that are producing ore. Activity is largely restricted to the three well known groups situated on Red mountain—the Centre Star-War Eagle group, Le Roi and the Josie group. Shipments of ore to Trail during 12 weeks to March 26 totalled 56,894 tons, of which the Consolidated Co.'s mines shipped 52,486 tons, the Le Roi No. 2 Co.'s Josie group 4,370 tons (including the concentrated product of the lower grade ore treated on the property), and the Blue Bird, in the south belt of the camp, 38 tons. The last-mentioned mine is being worked on lease, after having been idle for about a year.

The Le Roi No. 2, Ltd., has sent out from its office in London, England, the report for the month of February received from the managers of that company's Josie group of mines in Rossland camp. The included information relating to ore shipments and receipts and

expenditure follows: Shipped 1,350 tons of ore and 50 tons of concentrate. The receipts from the smeltery were \$9,129 in payment for 871 tons of ore, and \$648 for 53 tons of concentrate; sundry receipts were \$200; total receipts, \$9,977. Estimated costs for corresponding period were: For development \$11,000; ore production \$6,000, milling \$700; total costs \$17,700. In addition, there was expended on Capital Account \$70. The costs for the month were, in all, \$7,793 in excess of the total receipts. An explanation is given, as follows: "The net receipts for ore shipped were abnormally low, owing to the mine having been closed for a week during the end of January and the beginning of February. The shut down was necessary for extensive repairs to the hoist." Beside the work in connection with stoping ore there was done 481 ft. of new development.

General Notes.

While bad roads for the time being prevent hauling of ore from the Union mine, in Franklin camp, north fork of Kettle river, Boundary district, to the railway, at Lynch creek a distance of 25 to 30 miles, work is being continued in the district. A recent report was in effect that some rich silver ore had been found on his claims, distant about three miles from the Union property, by Mr. J. Gelinas. The Grand Forks Board of Trade has been informed that the Geological Survey of Canada and the Provincial Department of Mines will each send an official in this season to investigate developments since a Geological Survey party was last in that field. Extension of the railway from Lynch creek to Franklin camp is being urged on the railway company.

The Lillooet "Prospector" states that at the Broken Hill mine, in Lillooet district, "there is in sight 90 ft. of solid ore," and adds, "unlike that of most other Bridge River properties, the ore is base, and it will require a reduction plant of some magnitude to treat it successfully. The mine is virtually a quarry, and, so far as we have been able to learn, is in the hands of men quite capable, financially, of developing the proposition to a successful issue."

Information has been published relative to the value of ore shipped to Trail from the Silver Standard mine, in the neighborhood of Hazelton, Skeena River district. Receipts at the smeltery during February and March totalled 758 tons (about 730 tons dry weight). Returns for 460 tons sampled in February gave an average value of \$114.40 a ton, as compared with \$106.42 for 282 tons shipped last summer. If the remaining 270 tons proves to be of similar grade, the whole of the winter shipments will represent a total value in excess of \$80,000. Development below the 250 ft. level is in progress, and additional mine equipment is being put in.

The annual meeting of the Sunrise Mining Co. has been held at Prince Rupert. The company's property is situated on Nine-Mile mountain, near Hazelton. Not much development work will be done until after completion of the Nine-Mile Mountain wagon road. The Seaton Coal Co. (formerly the Grand Trunk B. C. Coal Co.) held its fourth annual meeting in Vancouver on March 24, and the Groundhog Anthracite Coal Co. shareholders met in annual meeting in the same city on March 25. The first mentioned of these two companies last year shipped four tons of coal to Nanaimo, Vancouver island, for test purposes. Under existing transportation conditions, however, with high freight charges on the Grand Trunk Pacific Railway, there is little encouragement to ship coal in competition with other coals not similarly handicapped.

NOVA SCOTIA

Dominion Coal Outputs.—The output of the Dominion Coal Co. for the first quarter of the year compares with 1913 as follows:

	1st Quarter, 1913, tons.	1st Quarter, 1914, tons.
Cape Breton Mines...	1,092,196	1,023,000
Springhill Mines....	98,987	94,624
	1,191,183	1,117,624

These figures show a decrease of about 73,000 tons. Like all other coal companies, both in Canada and in the United States, the Nova Scotian operators are feeling the lessened demand for fuel which the restriction of manufacturing and railway operations has brought about.

At the present time the Dominion Coal Co. has a more plentiful supply of labor than has been the case for six years, and because of the temporary lull in demand the men have been working with greater regularity. Some new records in production have been achieved during this first quarter. During March the long coveted mark of 19,000 tons was exceeded for one day's output, and on several occasions the collieries produced at the rate of over 20,000 tons per day. No. 2 and 9 collieries both made a new record. The output on the 25th from No. 2 colliery was 3,680 tons, and from No. 9 colliery 1,759 tons, making a total of 5,439 tons hoisted up one shaft. On the 27th No. 9 colliery hoisted 2,116 tons, and No. 2 colliery obtained 3,353 tons on the same day. This gives three new records for the company's largest colliery.

Although the weather during the first two months of the year was very cold, the winter has been free from snowstorms, and the company has been able to establish large banks of coal. It is probable that the labor supply will not be so restricted next summer as it was last year, and if so the shipments to the St. Lawrence will be larger than in any preceding season, if the trade depression does not cause greater severity in the American competition.

So far as it is possible to forecast at the present time, the opening of navigation will be later than last year, as the drift ice is very heavy in the Gulf.

Workmen's Compensation.—The Nova Scotia Government have brought forward a measure at the sitting session to appoint a commission of three or four members, "whose duty it shall be to examine into and report as to the laws in force in the Province of Nova Scotia relating to the liability of employers to make compensation to their employes for injuries received in the course of their employment; to examine into and report on the societies exempted from the operation of the existing Workmen's Compensation Act, and the terms and conditions under which societies should continue to be exempted or otherwise, and to submit a draft bill in accordance with such report."

This bill has particular reference to coal companies, at whose collieries approved relief societies are in existence. The action of the Government will meet with very general approval.

COBALT, GOWGANDA AND ELK LAKE

Right of Way.—While the discovery on the Right of Way is necessarily of limited extent it yet proves to be of greater length and extent than was at first anticipated. Sixty feet of ore has been opened on the 120-ft. level of the old No. 3 shaft near the Princess line. In

this 60 ft. the vein averages two in. in width with ore running between 2,500 oz. and 3,000 oz. The vein is undoubtedly an extension of No. 12 worked on the Princess mine, on which a 200 ft. ore shoot has been developed. It is hoped that the new ore body will be continuous across the property a distance of about 145 ft. It is not expected that there will be much more below the 120 ft. level as the contact is only a few ft. down at this point. The Right of Way is doing some exploration work at the No. 2 shaft at the 85 ft. level. One crosscut is prospecting territory under the office and buildings near the shaft, the other is being pushed north.

Peterson Lake.—There has so far been no disappointment in the development of the new ore body on Peterson Lake. The first car of ore that the company has ever shipped from its own workings will be shipped very shortly. It will be of high grade ore handpicked from the drift on the new vein. Twenty tons of high grade is now stored. It all has been taken from development work from the 200 ft. level. One hundred and ten ft. of drifting has been done towards the east on the new vein. In the face the vein early in the month showed similar values and width, viz., about two to three in. of high grade ore. The vein is sometimes two to three in. wide, at others it is split up into two or three stringers but the aggregate amount of high grade in the face is usually about the same. There is also good milling rock between.

The old winze on the old Kerry lease is being cleaned out at the 300 ft. level and a drill has been started at work there. From this point it is intended to catch the lead again. A crosscut will be driven on a vein of calcite until the contact with the conglomerate is reached. Four drills are working underground. At No. 1 shaft four headings are being worked all in exploration but so far nothing of any importance has been struck from this shaft.

Trethewey.—The total recovery from the Trethewey mine during February was 40,000, the lowest for some months. A total of 2,640 tons were treated during the month and the average assay of heads was 20 oz. The old workings at the south end of the property contributed the main production of milling ore.

Bailey.—Development on the fifth level of the Bailey Cobalt is causing the management much satisfaction. The vein is from two to three in. wide of smaltite and native silver and in spots the ore will run very high indeed, but the average will make a good shipping grade. Outside the vein proper there is about eight in. of wall rock with much native silver showing. Altogether at the bottom level there has been opened up 200 ft. of an ore shoot. This is the vein upon which the original discovery of the Bailey was made and from which the first car of ore was taken out by an open cut in 1906. On the intervening levels the vein has not been developed with any vigor. On the fifth level the vein is about 80 ft. below the contact in the conglomerate. In view of the new policy adopted several drills have been put on development in order to put ore in sight. So far the management has been so busy taking out ore whenever it was encountered that it was not possible to place the mine in a good position as regards reserves.

Buffalo.—The mill production from the Buffalo mine for the month of February shows a recovery of 103,256 oz. a decrease of about 35,000 oz. from the previous months. Tons milled 6,163; average assay per ton 21.601 oz. Ozs. of silver paid for 73,459.

Beaver.—The veins are now being worked in the granite on the Beaver mine on the 460 ft. level. In one vein the silver contents are very high and the ore will average 2,000 oz. to the ton. On the 530 ft. level driving west on No. 3 vein another vein has been cut. In 60 ft. of drifting on No. 3 vein all in granite, the vein was one and a half in. in width of 2,500 oz. ore. Drifting westward on the same level another ore body about 4 in. in width in granite was cut. The granite on the 460 ft. level appears to be about 70 ft. long, but its depth has not been established. Granite boulders have also been cut through in the Bailey and Buffalo mines and in each case there was no diminution of silver contents in the vein.

The Keeley Mine in South Lorrain is being opened up again after lying idle for the winter months. The shaft is being pumped out. The Keeley is under a long option to the Huronian Belt syndicate, an English syndicate formed to do business in Canada with a capitalization of \$1,000,000 in cash. It is learned that developments last year on the Keeley were quite satisfactory, two shoots of high grade ore being opened up, and there is every intention of prosecuting the work with vigor.

Savage.—At the present time 80 tons of ore is coming over the aerial tramway from the Savage to the McKinley-Darragh mill, three days the buckets carrying dump ore and three days ore from development underground. Last month the Savage contributed about 25,000 oz. Six drills are running at the Savage, all in development. As there is yet a large area of good conglomerate several crosscuts are being run. One drill is crosscutting towards the Nipissing, another towards Diabase Mountain, and another towards the Silver Bar line.

PORCUPINE, SWASTIKA AND KIRKLAND LAKE

Hollinger.—Remarkable strides in expansion are being made at the Hollinger mine. The foundations have been completed for the new power plant on Gillies Lake. The building, of solid concrete, will be 55 ft. by 140 ft., and has been designed to house two 4,500 cu. ft. compressors and other equipment. A novel feature in Ontario mining is the air chamber. A shaft has already been sunk on the edge of Gillies Lake. It will be taken down 230 ft. below the level of the lake. The air will be conserved in the air chamber at the bottom of the shaft by pressure of 200 ft. of water. The new power plant, which is being erected by the Canadian Mining Finance Company, will give the Hollinger and allied interests power for 110 drills. The present power plant will be used as auxiliary. The main vein has been cut at the 550 ft. level and it here shows 10 ft. of the usual grade of ore.

A sprinkler system will also be installed all through the Hollinger mine. It will cut the insurance rate very materially.

A consolidation of several old claims and prospects has been effected by Mr. C. L. Sherrill and his Buffalo associates, the centre claim being the Little Pet near the Porphyry Hill mine. The other claims are the two Woodhouse claims and the two Fogg claims. There is every intention of working the properties with all expedition. The deal involved altogether \$100,000 and an initial payment of \$10,000 has been made. A plant has been ordered and is now on its way to the Little Pet camp and will be installed at once.

The McIntyre mine has now opened up 200 ft. of \$23 ore six ft. wide. This should enable the McIntyre to pay off its debts, which so far have been a very serious hindrance to development. The McIntyre has a large tonnage of low grade ore, but with the present mill equipment it was not possible to treat this at a profit. With a fair tonnage of high grade ore profit can be made to pay off debts and instal machinery in the mill which will raise the tonnage and decrease the costs. A very aggressive development scheme is being maintained, the big compressor at the Pearl Lake mine in addition to the McIntyre compressor furnishing air for underground work. The March production from the McIntyre reached \$65,000. The heads from the mill being between \$14 and \$15 per ton.

Burnside.—The balance of the purchase price of the Burnside claim in Kirkland Lake has been paid into a Haileybury bank since the first of the month. It is about \$200,000. The payment was made by the Kirkland Lake Proprietary. Nothing is being done on the claims at present. As a matter of fact there is no further power available until the power line and installation from Charlton is completed. It is hoped that the "juice" will be available on May 1st. The power house at Charlton is completed and the stringing of wire has started. Poles are in position from Charlton to Dane.

Schumacher.—A good discovery has been made on the Schumacher property. The find was made in a cross-cut at the 100-ft. level to the southwest, and is quite new. The ore body is broken up across the face of the drift, and is, in places, remarkably rich. The whole face of the drift will average well.

Maisonville.—Considerable excitement has been provoked in Maisonville Township by a strike made on the Malouf claim. On Wolf Lake the Canadian Exploration Company is working the Mogridge claim, and has started a drift at the 50-ft. level.

In Munro Township the Huronian Belt Syndicate is working a gang of men on the Dobie claims on a working option. The whole of the district from Swastika north to the Munro field is quite active.

Hollinger.—The gross profits from the Hollinger for the four weeks ending February 25 were \$111,679, considerably higher than for the four weekly periods in January. The average value of ore treated was \$17.50 per ton, approximate extraction 97.40 per cent., milling costs \$1.313 per ton. During the period No. 8 vein was cut by a cross-cut on the 300-ft. level, and No. 4 vein was located with a diamond drill on the 425-ft. level.

Jupiter.—The shareholders of the Jupiter Mining Company ratified the deal made with the McKinley-Darragh-Savage Mining Company, whereby the latter company works the Jupiter. By this agreement the McKinley is to spend \$30,000 in development before September, and if prospects justify further expenditure they will take up \$50,000 in bonds and supply another \$40,000 for further work. In return the Jupiter shareholders will get a half interest in a new company of \$2,500,000.

Preston East Dome.—At the annual meeting of the Preston East Dome Mining Company it was shown that there was a bank balance of \$9,000. The company still owns two claims immediately east of the Dome. The principal expenditure during the year was on the Silver Bar, an option on which was dropped at the beginning of the year. The directors elected were Charles L. Sherrill, Colonel D. M. Robertson, R. T. Shillington, D. J. White, and Gordon Taylor.

Robb.—Owing to the spectacular nature of some ore taken from the Jamieson property in Robb Township there has been quite a rush to that section. It is reported that this claim has been optioned to Mr. C. A. Foster, of Haileybury, on a working option basis.

The Dome Extension Mining Company has taken over its own plant and may work it later in the summer. For several months the Dome Mining Company has rented the plant as an auxiliary.

Hollinger Reserve.—The General Development Company of New York, has rented the small mill at the McIntyre mine, in order to make a run of 200 tons of ore from the Hollinger Reserve mine, which they have under option. The ore is being hauled from the mine in Ogden Township to the mill at Schumacher.

DELORO GOLD CLAIMS SOLD.

Cobalt, April 4.—The Little Pet claim, the two Fogg claims and the two Woodhouse claims in the township of Deloro, Porcupine, just south of the Big Dome Mines, and surrounding the Porphyry Hill, figure in a deal completed yesterday. These claims were sold to Mr. Charles L. Shirill, of Buffalo, N.Y., and his associates in the Homestake Mines Finance Company. The deal involves more than \$100,000 in cash of which the initial payment of \$10,000 was made to the owners in Haileybury yesterday afternoon.

Preparations have already been made for a plant. Two 60 horse power boilers, a hoist and a six drill compressor are on the way to the camp and will be installed within a few weeks and active operations will commence on the claims within the next two months. The Little Pet has all necessary mine buildings, including the framework of a stamp mill and the new company will immediately order machinery for a twenty ton stamp mill to be installed this summer for testing purposes.

It is quite probable that the claims will be incorporated under a company to be known as the Porcupine Pet Mines.

Mr. Shirill is well known in Porcupine being connected with the Foley-O'Brien, Dome Lake, Shirill Porcupine and other properties in that camp.

The Little Pet was formerly owned by a company of that name and \$25,000 was paid on a deal for the claim. It was originally the Brydge claim, owned by John Brydge and a Haileybury syndicate and when the Little Pet Company failed to make the necessary payments it reverted to the original owners. Two shafts, one 100 feet and the other 50 feet have been sunk and this work will be continued. Some remarkably rich ore was mined by the Little Pet Company with which was associated Col. Weatherby of London, England, and Mr. Proctor Smith, of New York.

The Fogg and Woodhouse claims were also sold in the boom days of the camp but after a few payments were made they also reverted to the original owners, Mr. John Fogg, of Schumacher, and Mr. Harry Woodhouse, Mr. William Crawford and Mr. Teddy Edmunds of Haileybury, are the owners. The four claims had some good showings of gold but nothing extensive except surface work has been attempted.—Cobalt Nugget.

YUKON TERRITORY.

The Yukon Gold Co. has taken options on eight miles of Sixty-Mile river, where a gold strike recently occurred. The company has two Keystone drills on the

ground. It is stated that the strike appears to be the most important made in the Yukon since the discovery of the Fairbanks field, and is much more extensive than the Chisana field.

Advices from England state that there has lately been published in London an article, by Mr. Rowland Fielding Mimm, on the Klondike auriferous gravel mining industry, which, he says, has now reached a degree of importance unsurpassed elsewhere in any field of equal area. Two companies in 1913 produced \$5,000,000. The individual miner, with his rich bonanzas, has been superseded. The writer especially discusses the prospects of the Granville Company, of which Mr. Treadgold is managing director, and says that Granville will soon pay dividends on ordinary stock.

BRAZEAU COLLIERIES.

The Canadian Northern Railway Company finished its line to the mine several weeks ago, and this company has been shipping coal since the first day the steel reached the mine. The C.P.R. is finishing its line to Rocky Mountain House probably this month and will therefore provide another outlet. The stock of this company is not for sale.

VENEZUELA ORE.

A meeting of the bondholders of the Canadian Venezuela Ore Company has been called for April 9 at the Windsor Hotel, when the report of the engineer commissioned by the bondholders' committee to inspect the property in Venezuela will be read. The report is at present in the hands of Senator Curry as Chairman of the bondholders' committee. It has been summarized for presentation at the meeting on April 9 and is generally understood to be unfavorable.—Financial Times.

COBALT SHIPMENTS.

(The Daily Nugget.)

For a second week in succession nothing but high-grade material has left the Cobalt camp and seven mines figured in a total shipment of 612,965 lb. of ore which was sent out during the week ending April . The figures are just a few pounds below the shipments for the previous week when the same number of mines shipped eleven cars.

Of the shippers Crown Reserve had a high grade car for the Saxon Government from whom they hold a contract. Twenty tons of very rich ore went to Germany from the mine during the week. The Chambers-Ferland, an occasional shipper, appears on the list with a car of high-grade for Deloro. McKinley-Darragh leads off the weekly list with three cars of high with Coniagas second with two cars for their own smelter at Torold, Ont.

The shipments for the week ending April 3rd are:

	High-grade
McKinley-Darragh.	193,750
Coniagas.	147,400
Cobalt Townsite	63,720
Chambers-Ferland.	58,690
Trethewey.	47,070
Crown Reserve	40,000
Beaver.	62,435

Total. 612,965 lb.

The bullion shipments for the week are:

Mine.	Bars.	Ounces.	Value.
Nipissing.	61	71,771.69	\$41,627.58

MARKETS

STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.) April 8, 1914.

New York Curb.		Bid.	Ask.
American Marconi	4.00	4.12	
Alaska Gold	24.50	24.62	
British Copper	1.87	2.00	
Braden Copper	8.37	8.50	
California Oil	304.00	306.00	
Chino Copper	41.75	42.00	
Giroux Copper	.87	1.12	
Green Can.	37.00	38.00	
Granby.			
Miami Copper	23.75	24.00	
Nevada Copper	15.37	15.62	
Ohio Oil	182.00	188.00	
Ray Cons. Copper	22.00	22.12	
Standard Oil of N. Y.	218.00	220.00	
Standard Oil of N. J.	407.00	409.00	
Standard Oil (old)	1440.00		
Standard Oil (subs)	1025.00		
Tonopah Mining	2.06	2.25	
Tonopah Belmont	7.87	8.00	
Tonopah Merger	.61	.62	
Inspiration Copper	17.75	18.12	
Goldfield Cons.	1.50	1.62	
Yukon Gold	2.75	3.12	

Porcupine Stocks.

	Bid.	Ask.
Apex.	.02½	.03
Dome Extension	.09	.09¼
Dome Lake	.46½	.47
Dome Mines	9.60	9.70
Foley O'Brien	.24	.28
Hollinger.	16.10	16.25
Jupiter.	.12	.12¼
McIntyre.	1.50	2.00
North Dome.	....	.15
Northern Exploration	2.25	2.75
Pearl Lake	.07½	.07¾
Plenaunum.	....	.50
Porcupine Gold	.12	.12¼
Imperial.	.02	.02¼
Preston East Dome	.02½	.02¾
Rea.	.20	.25
Swastika.	.03	.03¼
West Dome	.10	.12
Porcupine Crown	1.00	1.05
Teck Hughes	.10	.16

Cobalt Stocks.

	Bid.	Ask.
Bailey.	.03½	.03⅝
Beaver.	.30	.31
Buffalo.	1.20	1.40
Canadian.	.08	.10
Chambers Ferland	.21½	.22
City of Cobalt.	.49	.52
Cobalt Lake	.50	.55
Coniagas.	7.80	8.00
Crown Reserve	1.71	1.75
Foster.	.06	.08
Gifford.	.02	.03
Gould.	.03	.03¼
Great Northern	.10	.10½
Hargraves.	.02	.03
Hudson Bay	70.00	76.00
Kerr Lake	4.40	4.60
La Rose	1.53	1.58

McKinley.	.75	.80
Nipissing.	6.30	6.40
Peterson Lake	.41	.41¼
Right of Way	.04¾	.05¼
Rochester.	.02	.03
Leaf.	.01¾	.02¼
Cochrane.	.60	.62
Silver Queen	.02	.03
Timiskaming.	.15	.16
Trethewey.	.23	.25
Wetlaufer.	.06	.07
Seneca Superior	3.00	3.25

TORONTO MARKETS.

April 11—(Quotations from Canada Metal Co., Toronto).

- Spelter, 5¼ cents per lb.
- Lead, 5¼ cents per lb.
- Tin, 40 cents per lb.
- Antimony, 9 cents per lb.
- Copper, casting, 15¼ cents per lb.
- Electrolytic, 15¼ cents per lb.
- Ingot brass, 10 to 15 cents per lb.

April 11—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto):

- Summerlee No. 1, \$26.50 (f.o.b. Toronto).
- Summerlee No. 2, \$25.50 (f.o.b. Toronto).

April 11—Coal—(Quotations from Elias Rogers Co., Toronto).

- Anthracite, \$8.25 per ton.
- Bituminous, lump, \$5.25 per ton.

GENERAL MARKETS.

April 8.—Connellsville Coke, (f.o.b. ovens).

- Furnace coke, prompt, \$1.90 to \$1.95 per ton.
- Foundry coke, prompt, \$2.40 to \$2.60 per ton.

April 8.—Tin, straits, 36.80 cents.

- Copper, Prime Lake, 14.75 to 15.00 cents.
- Electrolytic copper, 14.45 to 14.55 cents.
- Copper wire, 15.75 to 15.87½ cents.
- Lead, 3.80 to 3.85 cents.
- Spelter, 5.25 to 5.30 cents.
- Sheet zinc (f.o.b. smelter), 7.00 cents.
- Antimony, Cookson's, 7.20 to 7.25 cents.
- Aluminum, 18.00 to 18.25 cents.
- Nickel, 40.00 to 45.00 cents.
- Platinum, hard, 10 per cent., \$46.00 to \$47.50 per ounce.
- Platinum, hard, 20 per cent., \$49.00 to \$51.50 per ounce.
- Platinum, soft, \$43.00 to \$44.00 per ounce.
- Bismuth, \$1.95 to \$2.15 per lb.
- Quicksilver, \$38.00 per 75-lb. flask.

SILVER PRICES.

	New York cents.	London pence.
Mar. 25.	58	26¾
" 26.	58	26¾
" 27.	58	26¾
" 28.	58	26¾
" 29.	58	26¾
" 30.	58	26¾
Apr. 1.	58½	26⅞
" 2.	58¾	26⅞
" 3.	58½	27
" 4.	58¾	26⅞
" 6.	58¾	26⅞
" 7.	58¾	27
" 8.	58½	26⅞