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SEVENTEENTH YEAR OF PUBLICATION

The Canadian Mining Review

Established 1882

Vol. XVIII—No. vii. OTTAWA, JULY 31st, 1899. Vol. XVIII--No. vii.

MACHINERY DEPOT.

SCHOOL OF MINING,

KINGSTON, ONTARIO.

The Following Courses are offered

1—Three Years' Course for a Diploma in

(A) Mining Engineering.
(B) Analytical Chemistry and Assaying.

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(A) Mining Engineering.
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For further information see the calendar of Queen's University.

4—Prospectors' Course.

The School offers to Mine Foremen, Assayers, Prospectors and Mining Men generally, Special Courses of Instruction, beginning January 9th, 1900, and continuing eight weeks.

Next Session begins October 2nd,
. . . 1899 . . .

The School is provided with well equipped Laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. In the Mining Laboratory the operations of Crushing, Amalgamating, Concentrating, Chlorinating, Cyaniding, etc., can be studied on a large scale.

FOR CALENDAR OF THE SCHOOL AND FURTHER INFORMATION APPLY TO

Dr. W. L. GOODWIN,

DIRECTOR

SCHOOL OF MINING, KINGSTON, ONTARIO

PROVINCE OF NOVA SCOTIA.

Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

GOLD AND SILVER.

Under the provisions of chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones; five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.

17th YEAR OF PUBLICATION.

The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.
Secretary, Canadian Mining Institute, etc.

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VOL. XVIII., No. 7. JULY, 1899. VOL. XVIII., No. 7.

The Advance in Iron, and Its Effect on the Manufacture of Iron in Canada.

The wonderful revival of the past six months in the iron trade has had a most beneficial influence on the manufacture of iron in Canada. Last year's depression of trade in the United States, and the abnormally low prices current there, made most people consider a revival like the present almost impossible, and it was freely prophesied that with the enormous capacity of the mills in the United States any possible increase in demand could easily be overtaken, and that a boom such as we had twenty years ago was now out of the question.

The present position of the market shows that the unexpected very often happens—and yet it was not altogether unexpected. The railway companies and all large corporations had been economizing for years back, and they were in such a position that any large increase of traffic meant that they would be forced to a very large expenditure for rolling stock and plant. Trade, too, in Britain and on the continent was exceptionally good, and a large export business had been developed from the United States, due in a great measure to the high prices prevailing abroad, and the inability of British manufacturers to overtake the requirements of their foreign trade. When the home trade in the United States therefore began to improve, prices immediately went up with a rush. Then it was found that the furnace capacity was inadequate for the requirements of the steel makers, and the steel melting plants could not produce enough steel for the rolling mills. New furnaces and new plants have been put in operation all over the country, but the demand has been so great that nearly every plant in the United States has its product sold up for the next four or six months. Prices are, generally speaking, more than double what they were six months ago. Such is the position of the iron and steel trade of the United States and Canada today, and it is safe to predict that this state of affairs will continue at least over the next year.

There is only one thing that can stimulate the manufacture of any article or the development of any industry, and that is the prospect of a fair profit. The iron trade of the United States owes its position today to the careful nursing by protection that it has had during the past thirty years. The profitable nature of the business of iron making enabled men to invest large sums of money in prospecting and developing the mineral resources of the country, which had a large market in itself and had not to look to an export trade for support. There is no doubt that the pioneers in this development made good profits, but this was the incentive. They took great risks, and had it not been that a larger margin of profit was possible than can be realized from similar industries in old established countries, it is very doubtful if the present stage of development would have been reached for many years to come.

The internal competition which resulted from this state of affairs soon began to force prices down to a competitive basis. New and improved methods of handling and transporting ore were used, larger furnaces were built, the mills were equipped with labor saving machinery, and it is now beyond question that the large steel companies of the United States are to-day better equipped and better conducted than any similar mills in Great Britain.

Let us now turn to Canada and consider if the present condition of trade does not warrant us in believing that now is the time for a similar development of iron manufacture in this country. When pig iron was selling at $6.00 to $7.00 in Alabama and $9.00 to $10.00 in Buffalo there was little incentive to push iron making here vigorously, but those who have carefully considered the situation unite in saying that although prices will undoubtedly recede from their present height, the famine prices of the last few years are not likely to recur, and trade will settle down to a higher basis of values than have been current for many years. What does this mean for Canadian iron makers? It means that the cutting and slashing of prices to secure the Canadian trade, which has been so common among Americans, has ceased, and we will have to stand only legitimate competition. This is quite apart from the question of the natural position of Canada as a producer of iron. That this is the view taken of the position of the trade by the leading financiers of this country is evidenced by the strong support given to the new Dominion Iron and Steel Co., Limited, which is about to construct four large furnaces at Sydney, C.B., and to follow this up by putting in a large plant for the manufacture of steel. The wisdom of locating these furnaces at Sydney is apparent when we consider the peculiarly favorable location of that town for the manufacture and export of iron. One of the chief reasons why Scotland has taken the lead in the manufacture and export of iron in the past is because her deposits of coal and iron, her furnaces and rolling mills, are situated close to the sea-board near Glasgow. They can thus avoid the cost of carriage to the point of shipment. The present cost of transporting pig iron from the Scotch furnaces to the steamer in Glasgow is about 50 cts. per ton, and on manufactured steel, such as bars, plates, angles, etc., the rate is 75 cts. per ton. Compare this with the United States. The rate of freight from Pittsburg to the export steamer in New York for manufactured steel is 12 cts. per 100 lbs. or $2.40 per net ton. We have not the figures on pig iron, but estimate the rate would be about $2.00 per gross ton. As a matter of fact we have not heard of any

coke iron being exported to Britain from the Pittsburg district. It has been almost altogether Southern iron from Tennessee and Alabama that has been shipped. In the case of Sydney these transport charges will be avoided altogether. Suitable coal is present in abundance, and the necessary coke ovens will be built close to the furnaces, which are at tide-water, where the largest vessels can load. Iron ore will be brought from Newfoundland, supplemented to some extent by the local ores in the neighborhood. It would thus appear that we have here a combination of the most favorable conditions for the manufacture of iron, and there is not the slightest doubt that iron will be produced in Cape Breton at as low a price as is possible under the most favorable conditions in the United States.

There is at the same time no reason why this development should be confined to Cape Breton alone. Nearly all the ore smelted in the Cleveland and Pittsburg districts is brought from Lake Superior and there is no doubt that the same deposits of ore occur on the Canadian side of Lake Superior. This has tempted the location of a charcoal iron furnace at Midland. This town is also peculiarly adapted for the manufacture of charcoal iron. The ore can be transported either from the American or Canadian mines on Lake Superior at as low, if not lower rates than to Cleveland or Buffalo, while the wood necessary for charcoal is practically inexhaustible in that region. This furnace will be in operation within the next year, and it is safe to predict that it will be able to place charcoal iron on the Ontario market at as low as American figures in Detroit.

The development of the iron trade in Canada will not stop there. The next step should be the opening up of iron mines on the Canadian side of Lake Superior. Recent prospecting has shown that several of these mining properties are as rich in fine ore as any on the American side, and will amply repay the very large expenditure which will be necessary to put them in shape to compete with the American ore fields. Any railroads that may be necessary to penetrate into the interior for the purpose of bringing down the ore to the lake for shipment should receive the hearty support of the Government. It is very gratifying to those in the steel and iron business to know that both political parties in the Dominion Parliament as well as in the Provincial Legislatures are united in the policy of supporting the development of this important industry. The extension of the bounties on pig iron and steel for a further period of five years from 1902, will strengthen the hands of all those who are working up this business. We are strongly of the opinion that long before that period has elapsed the Canadian iron industry will be in a strong enough position to compete with other iron producing countries for the export foreign trade.

The Caledonia Accident.

Last month we but briefly referred to the deplorable explosion at the Caledonia Colliery, at Glace Bay, Cape Breton, preferring to wait until more authentic particulars than those given in the press despatches were available. It appears that in some unaccountable manner a fire started in this pit a little after one o'clock on the morning of the 16th of June. For over an hour the man in charge of the pit endeavored to locate it; finally he sent word to the underground manager, Mr. Thomas Johnstone, and directed the men to leave the pit. The underground manager was shortly on the ground and collected a party of men who went into that section of the pit where he was told the fire was burning. This information was apparently misleading, as the fire was burning some distance away from its supposed location. As they approached the place to which they were directed the fire was on one side of them and having in some manner communicated with, or formed, a small quantity of gas, a slight explosion occurred at the seat of the fire. The effects of this explosion were felt by Mr. Johnstone's party and they were suffocated by the after-damp caused by the explosion. A prompt and successful attempt was made to get out the bodies of the men by means of parties of rescuers headed by Mr. John Johnstone, Assistant General Manager, Thomas Brown, manager of the pit, Mr. Joseph Hudson, Deputy Inspector Neville and others. One of the bodies could not be found at that time but was subsequently recovered. Further search located the fire in the pump-house situated directly to the dip of the main shaft. Attempts were made to extinguish the fire by buckets, etc., but it was found that it advanced more rapidly than they could put it out. Attempts were then made to get water on it by means of pumps, but a heavy fall of the roof prevented this. It was then decided to admit sufficient water to the neighbourhood in which the pump was situated so that the lower end of the incline would be shut off from the air. As soon as this was done the air was reversed and the smoke and flames driven back upon the water. After great trouble and several failures men were able to carry air with them and to advance upon the seat of the fire. An attempt was then made to extinguish the fire by means of water but the roof deprived of its support by the burning of the timber props fell heavily and drove the men away. These falls, however, seemed to have the effect of crushing out the fire and a few days afterwards the ventilation was restored throughout the pit. It was then decided to build off the fire district by walls of stone, closing all openings through which air might get access to the district in which the fire had started. This work is now being completed and it is anticipated that no danger will be experienced from the fire. The main pump of the mine was situated at the foot of the old incline driven straight to the dip from the bottom of the main shaft. Some years ago the workings around the lower part of this incline crushed. The levels and workings on the east side of the incline were totally closed; on the west side they were partly closed, and by great exertions the incline itself and the lower west level were kept open in order that the pumping station might be maintained. These openings were thickly timbered as the roof had become very much broken. The fire when first found was burning in the pump-house, from which it spread upwards between the two crushed districts toward the pit bottom. The only person in that part of the mine that night was the man in charge of the pump. He declares that he saw nothing wrong during the time of his underground employment. It is impossible at present to assign a cause for the starting of this fire especially as the pump-man declared at the coroner's inquest that everything was all right. The coroner, Mr. Whalen, held an exhaustive inquiry, examining almost every man that was in the pit that night. This enquiry did not throw any light on the cause of the fire but exonerated the officials from any blame.

Lead Smelting in British Columbia.

Some three weeks ago I had the pleasure of inspecting the smelting works at Trail, British Columbia, which are now operated in the interest and under the direction of the Canadian Pacific Railway Company, which, since its purchase of these works, and of the railroad connecting them with the Rossland mines, has expended nearly $2,000,000 in improvements or the plant. Mr. Walter H. Aldridge, who has had and still retains the direction of this department of the operations of the Canadian Pacific, is an American metallurgist, educated at the Columbia School of Mines, trained successfully in every department of practice under Anton Eilers (the most competent of masters), and certified by the record he has made in Colorado and Montana as among the first of the younger generation of American metallurgical experts and managers. Backed by the confidence, as well as the capital of

the railroad company, he has been able to construct at Trail a smelting plant which, in some respects, might be studied with advantage by his American colleagues. I do not purpose to give at this time a description of it, but I may remark, in passing, that it is the only place of the kind where I have not observed the presence of numerous shovellers. The mechanical arrangements for receiving, handling, sampling, etc., are admirable; the fuel (coke from the Crow's Nest mines in British Columbia) is superior in quality to anything produced in the United States west of the Mississippi; and altogether I see no reason to doubt Mr. Aldridge's estimate that he can smelt at these works at least as cheaply as it can be done on the American side of the line. Concerning the new works which he is preparing to erect in the Boundary District, I say nothing, because I know nothing.

With regard to the Trail works (and, I presume, the Boundary works also), it must be confessed that their management by the Canadian Pacific Railway Company, as compared with that of individual owners, or smelting companies, is, at the present time, a great advantage to the mining industry of British Columbia. For the railway company appears to be willing to do what separate concerns could scarcely undertake, namely to reduce smelting rates to figures involving little or no profit, with the view of increasing as rapidly as possible the active development of mineral resources, and consequently the amount of business for the railway. During my recent sojourn in British Columbia I read a good many local newspaper articles, of a type familiar to me, attacking this "grasping corporation." It is the usual course of history in pioneer communities, that all sorts of inducements are held out for investment of capital in mines, railroads and other needed improvements, and that such enterprises are universally popular as long as they are disbursing money; but that, as soon as they begin to try to get returns for their money, they are denounced as extortionate and oppressive. Sometimes this charge may be true; but it is sure to be made, whether it is true or not. With regard to the present course of the Canadian Pacific Railwiay Company toward the mining industry of British Columbia, I am convinced that it is more liberal than any independent enterprise could afford to pursue.

Of course I do not mean to say that this policy is purely altruistic. As I have already observed the company hopes to be rewarded for its liberality by an increase of industry and business. In my judgment, the great question at this time is, whether such an increase will take place, and the immediate interest of the mining community of British Columbia lies, not in denouncing "on general principles," the Canadian Pacific Company, but in urging and favoring, in any possible way, whatever will encourage that company in its present attempt to develop the resources of the Province.

At the time of my visit the Trail smelting works were running on copper ores only, though ready to start at short notice in the smelting of lead ores. For their supply of copper ores they are dependent upon the product of two or three mines at Rossland. As the whole region is full of prospectors for copper, other sources of supply may be developed hereafter; but the immediate outlook at Rossland is not specially encouraging in that respect; the prospect of an increased supply of copper ores being mainly confined, just now, to the mines already shipping to Trail, which will very probably be able to increase their product, having large reserves. It is well known these ores are peculiar, consisting of pyrrhotite, pyrite and chalcopyrite, carrying also gold. Gold is also contained in the accompanying silicified vein matter, though it be free from sulphides. For any larger tonnage, the business must be a low grade proposition; and this fact has been recognized by the management of the smelting works, which encourages by low rates the shipment of the largest practicable quantities. Fortunately these works command, besides their exceptionally good fuel, a supply of highly suitable limestone as flux.

As regards lead ores, the works must, at present, depend upon getting a part, at least, of the ores of the Slocan region, which now go into the United States for reduction. So far as the mere cost of smelting and the production of base bullion is concerned, the Trail works can probably compete favorably with American establishments, but they are handicapped in the sale of their product by the fact that there are no refineries in Canada which can transform base bullion into the marketable forms of pure lead and pure silver or dore bars. Nor would it be prudent to build a refinery for such purposes before a sufficient steady supply of base bullion had been assured to it. The alternative, of course, is to send the bullion to be refined in bond in the United States, until it will pay to do the refining in Canada. Under the United States law, this can be done without the payment of an import duty, but unfortunately the Canadian law, as now administered, requires the refined lead to pay a duty of 15 per cent. upon its re-entrance into Canada. At the same time, lead imported from England is favored in the Canadian tariff by a differential deduction of 25 per cent. of the duty. The result of this curious arrangement is that the Canadian producer, after having his lead refined in the United States, may be forced to sell it in England and have it reimported from there.

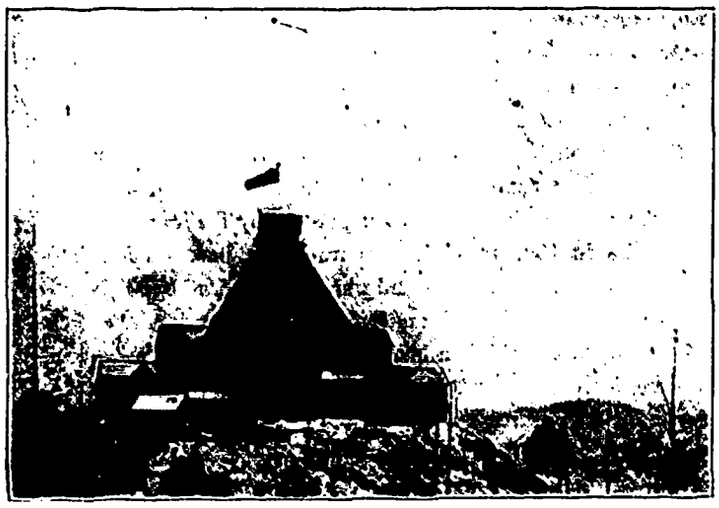
This practically deprives him of any advantage in the Canadian market. That market is small, the consumption being only some 3,000 tons annually, but to this small extent it seems fair that the Canadian smelter should have the natural advantage of his geographical location, by being enabled to bring back to Canada, free of duty, the lead produced in Canada and refined in the United States. This, in my judgment, would be the simplest, most equitable, and most effective way of encouraging lead smelting in the Dominion, while enabling the Canadian consumer to obtain Canadian lead without paying the unnecessary cost of transportation twice across the Atlantic.

I understand that the Canadian Pacific Company has petitioned for this encouragement, but I do not know with what prospect of success. The only objection of which I have heard is, that the measure would involve a loss of revenue to the Dominion of some $37,000 now collected on the annual imports of lead. This seems a small matter in view of the magnitude of the interests concerned, as the following figures will show:

Since the acquisition of the Trail smelting works, in March, 1898, by the Canadian Pacific management, they have smelted 43,000 tons of Rossland copper ores, the actual operation covering about five months. For the smelting of these ores the pay rolls have been $148,444; the general expenses $396,164, and the payments for ores $694,238, making a total expenditure of $1,238,846 by the company. This might have been doubled if lead ores also had been treated, there being from 40,000 to 50,000 tons of lead ore mined annually in British Columbia, the whole of which was shipped last year to the United States.

The result of present encouragement of lead smelting in Canada would ultimately be to increase the Canadian consumption, by promoting the establishment in Canada of manufacturing involving the use of lead; and no doubt the ultimate result would be the refining of lead in Canada. The present sacrifice of $37,000 duties seems a small price for such future advantages. R. W. R.

—From Engineering and Mining Journal, 3rd June.



Surface Works at War Eagle Mine, Rossland, B.C.

EN PASSANT.

The members of the Canadian Mining Institute will leave Montreal on their excursion to British Columbia on Friday evening, 1st September, at nine o'clock. The excursionists will be away three weeks, visiting Rossland, Trail, Northport, Boundary, the Slocan, Ymir, Nelson, and the collieries at Anthracite, Canmore and the Crows' Nest Pass. A very liberal programme of excursions and entertainments has been arranged at the various points to be visited, complete particulars of which are given in the neatly gotten up booklet issued by the Secretary. Members of the Institute, who have not yet intimated their intention to take part in this outing, are requested to communicate with the Secretary without delay, in order that suitable accommodation may be reserved for them.

The fall meeting of the members of the Institute will be held at Nelson, British Columbia, on Tuesday evening, 12th September. Among those who will contribute papers we note the names of Mr. Howard West, A.R.S.M., New Denver; Mr. W. Pellew Harvey, F.C.S., Vancouver; Mr. S. S. Fowler, E.M., and Mr. R. R. Hedley, Nelson, and Mr. Wm. Blakemore, M.E., Fernie. A meeting will also be held at Rossland, when a number of papers relating to the geology and mining practice of that interesting district will be presented. Members of the Institute, by special arrangement with the Canadian Pacific Railway, will be carried at a particularly low rate on presentation of their certificate of membership.

A number of the members of the American Institute of Mining Engineers have signified their intention of travelling to British Columbia with the Canadian Mining Institute excursion *en route* to their meeting at San Francisco on 25th September. The Canadian Pacific is arranging for our American visitors a special rate from New York and Chicago to San Francisco *via* British Columbia.

Mr. Wm. Blakemore having severed his connection with the Crow's Nest Pass Coal Co., Limited, Mr. James Johnstone has been appointed to the position of General Manager.

One of the most consistent bullion producers in the new gold fields of North Western Ontario, has been the Mikado Gold Mining Co., operating at Shoal Lake, Lake of the Woods. Its 20 stamp battery commenced crushing on 9th August, 1897, the first two months returns giving a yield of 2,313 oz. from 1,470 tons, or 1 oz. 13 dwts. per ton. We have been officially advised of the following returns for 1898 and the first six months of 1899, which are sure to be of interest to those of our readers who take an interest in gold mining development in Ontario:—

1898.	Oz.	1898.	Oz.
January	462	July	251
February	560	August	265
March	730	September	134
April	444	October	227
May	169	November	250
		from Cyanide	74
June	240	December	393
		from Cyanide	74

1899.	Gold. Oz.	Bullion from Cyanide. Oz.
January	407	143
February	316	100
March	236	175
April	334	142
May	313	148
June	288	304

The Regina, in the same district, although, perhaps, the most extensively developed gold mine in the Lake of the Woods, has so far been rather a disappointment, the returns for 7½ months' working in 1898 being but $28,633.23.

We suspect this property, like many other new ventures in Ontario, has not been handled as well as it might have been. From all accounts, this is a good property, which should with capable and economical management, be doing a good deal better for its shareholders than merely paying its way.

We are pleased to hear of an improvement in the market for Canadian phosphate. A contract has recently been made, we are informed, for 1,000 tons at $12.00 per ton, for Canadian consumption.

The House of Commons this month ratified the Hon. Mr. Fieldings Resolution, renewing the bounties on Canadian iron and steel. The Resolution provides:—

"That it is expedient to provide that the bounties on steel ingots, puddled iron bars and pig iron made in Canada, authorized by Chapter 6 of the Acts of 1897, shall on the termination of the period therein mentioned, be gradually reduced during a limited term until they are extinguished, and that the bounties to be paid for the additional term shall be as follows:

(*a*) From the 23rd of April, 1902, to the 30th of June, 1903, both inclusive, the bounties shall be ninety per centum of the amount fixed by the said Act.

(*b*) From the 1st of July, 1903, to the 30th June, 1904, both inclusive, the bounties shall be seventy-five per centum of the amount fixed by the said Act.

(*c*) From the 1st of July, 1904 to the 30th of June, 1905, both inclusive, the bounties shall be fifty-five per centum of the amount fixed by the said Act.

(*d*) From the 1st of July, 1905, to the 30th of June, 1906, both inclusive, the bounties shall be thirty-five per centum of the amount fixed by the said Act.

(*e*) From the 1st of July, 1906, to the 30th of June, 1907, both inclusive, the bounties shall be twenty per centum of the amount fixed by the said Act.

Provided, however, that if any steel ignots be made from puddled iron bars manufactured in Canada, no bounty shall be paid on such steel ingots.

The said bounties shall cease and determine on the 30th of June, 1907."

We are indebted to Mr. Archibald Blue, Director of the Ontario Bureau of Mines, for the returns of mineral production in Ontario during 1898. Mr. Blue estimates the total value of the production at $7,202,891. Here are a few figures from his summary: Petroleum and its products, $1,970,534; Natural Gas, $301,600; Copper, $268,080; Nickel, $514,220; Pig Iron, $530,789; Iron Ore, $48,875; Gold, $275,078; Silver, $51,960; Salt, $278,886; Gypsum, $4,000; Graphite, $6,000; Mica, $7,500. The industry gave employment to 7,478 persons, the amount distributed in wages during the year being estimated at $2,456,785. We might add that at no time in the history of Ontario has there been so much activity in mining enterprises as during the present year, and we are confident the returns for 1899 will show a very substantial increase in the value of our mineral production from this Province.

We are indebted to Mr. W. E. Libbey for an exceedingly handsome and unique specimen of the ore taken from the rich strike made last month at North Brookfield, Queen's County, Nova Scotia. It is noteworthy that this strike was made at a depth of 562 feet. Mr. Libbey writes that his Company has driven through this rich lead in sinking, and that they do not expect to get any more of it until the next level has been run.

It is noteworthy that the Brookfield mine produces annually about 4,000 ozs. of bullion, the vein, which averages about 14 inches, yielding about $17 per ton. The property is equipped with a 20-stamp battery and a very complete Thies chlorination plant.

The disposition of so many of our people to go off at half-cock on matters mining, particularly during the present craze for gambling in mining stocks—many of them, by the way, absolutely worthless, and most of them unreasonably and grossly inflated—is pertinently pointed out by the Toronto *News*. It is so refreshing to read anything in the mining columns of a Toronto paper, which has not been inspired, or written, by some enterprising rubberneck or curbstone broker with stock to sell, that we give space to the item with pleasure. The *News* says: "Man is a very inconsistent being. If he happens to have a few thousand dollars to spare and is asked to invest in a gilt-edged mortgage on a St. George or Jarvis street property, he hesitates until he has had a consultation with his lawyer. Before he advances a cent he has the title searched from the Crown down to the present borrower, he scurries to the sheriff to ascertain whether or not there are any judgments against the applicants, and he visits the city hall to see how the tax bills have been paid. Then he cautiously hands over the money. But if this same canny individual catches the gold mine fever he acts for all the world like a lunatic. He rushes to a mining broker, whom possibly he does not know from Adam, and, without asking any questions, he buys stock in something he calls a gold mine, but in which there may not be enough gold to fill a hole in his wisdom tooth. He neither knows nor cares whether this property with the glittering name is situated in British Columbia, in the Lake of the Woods district, or in Timbuctoo. He may never have been further west than Springfield-on-the-Credit, but he has seen the name of his mine appearing daily in the newspapers, and he concludes that where there is so much ink there must be some gold. And so it happens that he who takes every precaution when asked to risk his money on undoubted security lying under his very eyes, insists on risking his money in hazy affairs purporting to have a habitation in some remote locality. Toronto has a continental reputation for its abiding faith in schemes which might properly be catalogued 'wild-cat.' It is said that a number of grateful citizens of Spokane once thought of erecting a monument in their chief square and labelling it, 'In Honor of the Suckers of Toronto.' It is to be remembered that this city, in sinking her money in non-paying speculations, injures herself in exact proportion to the amount squandered." We are afraid when the reckoning comes Toronto will not be the "only pebble on the beach."

It is not always easy to understand why so many men whose characters are above reproach, whose reputation for honesty and truthfulness are never questioned, who have the fullest confidence of their fellow-men, when they engage in mining transactions, cast aside all regard for fact and make the most extravagant statements concerning the property that they are trying to promote. It has become almost axiomatic that many men, truthful and upright in all other walks of life, will lie when talking mines, and evidently it is expected. So common-place has this practice become that it would seem that one must greatly exaggerate his statements in order to have a small portion of the truth believed. In part, this habit or custom is no doubt due to lack of knowledge of mining affairs. When describing a vein it is so easy to give its greatest width as its average width, and the greatest value as the average value, that it is done almost inadvertently, and is not looked upon in the light of misrepresentation of facts, and is not done with a purpose to deceive, for there are facts to substantiate a portion of the statements at least. Then, too, mining is such an enticing business. Who may say that a vein 4 feet wide at the surface, or near it, may not widen to 40 feet in depth, and who shall dare to assert that when $100-rock has been found in the small vein, that the whole 40 feet will not be $100-ore in depth, and the promoter gives the mine the benefit of the doubt, worked up by his own enthusiasm, and states it first as a probability. After repeating the statement a few times to various people and revolving the great posibilities of the mine in his mind, the probability becomes fact and is stated as such without hesitancy, and he becomes indignant at even a suggestion that he is dealing in fancies. It must be enthusiasm that causes upright business men to misstate facts concerning the development of value in a mine; and as this peculiar human weakness is recognized, everyone seems willing to overlook the ungarded statements and to make due allowance for enthusiasm, and if, after such deduction is made, there still remains a fair sort of business proposition, some mining engineer who is unenthusiastic is usually employed to ascertain the truth.

In addition to the large iron and steel plant to be immediately constructed by the Dominion Iron and Steel Company at Sydney, Cape Breton, we are informed that it is also the intention of the Nova Scotia Steel Company, Limited, to erect an additional furnace in the same neighborhood. There is a sound and substantial mining boom on in the Province by the sea.

The Canadian Mining Institute has issued to members another handsomely gotten up volume of Transactions, covering the proceedings of the meetings held at Montreal in March last. This issue of the Journal contains close upon 300 pages, and is profusely illustrated

with excellently done engravings, photos and maps which accompany the letter press of the 23 papers contributed by the members. These volumes of the Institute are the best evidence of the vitality of the organization, and will, we are quite sure, compare very favorably with the publications of much older and larger institutions of a similar character. The library of the Institute, we may say, is now very well equipped with standard works of reference and literature bearing upon the mineral wealth, mining industries and mining practice of the Dominion. It is very conveniently situated on the ground floor of the Windsor Hotel at Montreal, and is proving of immense service to the many visitors and mining men who pass through the city.

Before another issue of the REVIEW is in the hands of our readers, subscribers will receive the ninth annual issue of our *Canadian Mining Manual*, which will be found to be a complete work of reference to the mining and smelting companies of the Dominion and Newfoundland. In this issue very full details are given of the history, organisation, capital, dividends, directors' reports and balance sheets, property and method of working, machinery equipment, output, sales, milling and reduction plants, and a mass of serviceable information respecting some 1500 companies. The complete success of it is standard work of reference has induced us to largely increase this year's issue, particularly in order to meet the demand for such a publication in Europe. The *Manual* for 1899 will be in the hands of our readers, we expect, by the 21st proximo.

Canadian graphite is steadily winning favor with American and European consumers and the exports from Canadian producers are likely to be materially increased this year. In a letter to one of our companies an American importer writes: "The goods give perfect satisfaction and a good quality of flake is scarce in this market. We have one customer at the present time who stands ready to contract with us for one ton of flake per week, and this is only one of a great many contracts we can secure."

Prospectors and others always need to remember that, in opening up a new camp, absolute honesty in regard to values is essential. A well defined lead may not have values at the surface and yet be a good property, while all possible effort at deception will not make a mine out of a barren lead; and such effort being certain of detection, results in serious setback to a district which may have real merit. A case is in mind where a clumsy effort to deceive resulted in a withdrawal of all proffers or notice from intending investors, when a straight statement of facts and an honest showing would have secured what most prospectors want—a good price for an undeveloped claim. It is not well to bank too much on the possible ignorance of the man sent to examine the property, but vastly safer and fairer to give him credit for a little knowledge; and, purely as a matter of business policy, more satisfactory all round not to attempt any cheap little tricks that are sure to be found out and are as sure to hurt the whole district. One such transaction often gives a deserving locality a setback that will take years of genuine merit and proved value to overcome.—*Mining and Scientific Press.*

"Deep-level mining in the Transvaal, as far as the first row of deep mines is concerned," says the *South African Mining Journal*, "has thus far, under careful, experienced management, proved an unqualified success, and the time is not far distant when the second line of deep shafts will enter the ranks of producers." The difference between very deep mining and that which is moderately deep is in some cases so radically different that success may not attend the efforts of those who do not fully grasp the situation in its broadest sense and who are able to meet the changed conditions with the necessary financial outlay. Deep mining—that is, mining deeper than 3,000 ft.—involves, usually, very heavy surface plants, the lifting of larger quantities of water to greater heights, and, possibly increased temperature; but, from a mechanical standpoint, it may be said that mining will be carried on to a depth as great as it is possible to sink shafts and hoist heavy loads with a single cable. When a cable is very long—3,000 ft. or more—the "springing" of the rope is the cause of some difficulty, but the inconvenience caused by this is usually overcome by the use of chairs at the stations. To how deep a point mining can be carried on successfully is not known, but it is believed to a much greater depth than the deepest mines of the present day—about 5,000 ft. Economic conditions usually determine the depth to which a mine is worked; but, if the value of ore deposits warrant it, it is safe to say the depth to which mines will be worked will be very materially increased.

California has had the largest hydraulic mining plants in the world, and California miners are putting in equally extensive apparatus elsewhere. At the Consolidated Cariboo Hydraulic Mining Company's property near Quesnelle Forks, B.C., Mr. J. B. Hobson, an old Placer Co. miner, has put in considerable development work. Two lines of sluices, 7 ft. wide, were placed in the bed of the gulch, paved with steel riffles, weighing in the aggregate 79 tons. A canal 7 by 13 ft., 10 miles long, was commenced in June and completed November 15. A dam 485 ft. long on top and 50 ft. high was constructed across the outlet of a lake at the head of the canal for storage of about 550,000,000 cubic feet of water. The construction of this dam and the canal furnished employment for 350 men and 120 horses and cost $125,000. During the progress of the opening up of the lower or bed-rock bench of gravel rich gravel was found. About 75,000 pounds of dynamite, 75,000 pounds of black blasting powder and 100,000 pounds of other miscellaneous mining supplies are used annually at the mine, which has now completed thirty-three miles of canals and three storage reservoirs having a total area of 2184 acres and a storage capacity of 1,016,000,000 cubic feet of water. About $1,000,000 has been expended in equipment of the property since 1894 and about $500,000 in gold has been recovered during the progress of development work. It is estimated that the company's leases contain about 400,000,000 cubic yards high-grade gold-bearing gravel. It is proposed to extend and increase and to open up the property in other places.

Mr. M. Eissler's volume, "The Cyanide Process for the Extraction of Gold" (Crosby Lockwood), helps us to form a very fair idea of the extreme value of the cyanide process in the treatment of the ores of the Witwatersrand and other goldffelds. Dealing with the Rand particularly, he points out that out of a total gold production of 1,478,470 oz. in 1893 there were produced from the tailings 330,510 oz. by the cyanide process, and in August, 1894, out of the monthly production of 174,977 oz., nearly 58,000 ozs. were won by cyanide. In 1897 the total output of the mines was 2,565,164 oz., and of this, on the basis of the returns for December, 1897, the amount recovered by the cyanide and Siemens processes was equal to 32 per cent. of the whole. When we consider that at least one-third of the prodigious amount of gold which Bergrath Schmeisser estimates the reefs of the Rand to contain, will be won by cyanide, it is difficult to over-estimate the importance of the work which the McArthur-Forrest Company has done in bringing its process into its present position of prominence in the Witwatersrand goldfields. Mr. Eissler has something to say of the comparatively-recent Siemens and Halske process. This consists of

precipitating the gold by electricity on sheets of lead. Owing to certain economical advantages, the author thinks it may be anticipated that the Siemens and Halske plan will prove a formidable rival to its predecessor.

Experiments with nickel steel made recently by the British admiralty have brought out some interesting points in favor of that material. For 12 months plates of nickel steel, ordinary mild steel, and wrought iron were immersed in the sea, and the loss of weight in that time due to corrosion worked out at 1.36, 1.72, and 1.89 per cent. respectively. A number of bars of nickel steel and carbon steel, 1¼ inches square and 18 inches long, were some time ago placed on supports 10 inches apart, and a weight of 1,000 pounds allowed to fall on them from a height of 3 feet, the bars being reversed after each blow. The carbon steel was fractured after 5 blows and broken after 12 blows, whilst it required 7 blows to fracture the nickel steel and 35 blows to break it —an increase of 147 per cent. It is the general opinion of engineers acquainted with the qualities of this material that it should be adopted for cylindrical boilers that have very thick shells, such as are used in large steam vessels; a saving of 25 per ceut. could be effected in weight.

For shafts that do not exceed 900 ft. in depth the endless chain winding plant seems to offer advantages in respect of economical working. In a paper read before the South Wales Institute of Engineers, Mr. T. O'Donahue gave an interesting description of the winding gear of the Rowley Colliery, near Burnley, which lifts from a depth of 90 yards. A pair of vertical engines with cylinders 12 in. by 2 ft. stroke, with steam at 45 lbs. pressure, supply all the power required for the winding chains. The chains are made from bar iron 1 in. by ½ in. in section, to form links 14 in. in length between centres. There are two endless chains of a total weight of five tons, and these pass over two vertical driving wheels at the top of the shaft. The wheels are 5 ft. in diameter, and are each provided with seven lugs which engage the chains. At the bottom of the shaft the chains pass round two smooth-faced pulleys which have flanges only on their outer sides. The chains are 4½ ft. apart, and are connected every 25 ft. by a crossbar about 2 in. in diameter, which is provided with a hook in the middle for hooking on the tubs. At Rowley Colliery it is found most convenient to hook on at every third bar, as the output is small. The initial cost of the chain winding plant is incomparably smaller than ordinary gear, and the working cost much less. Three men at the top and two at the bottom can bank 600 tons per day, and there is no engine attendant. The chief bank man stops and starts the engines at will by means of a lever near the shaft. With unbalanced loads, ordinary winding engines are, in some cases, six times the theoretical power required, whilst, with a good method of endless winding, the horsepower of the engines is reduced to one-fourth of that ordinarily required, and by compounding and condensing the engines could be made still more economical. There would thus be a saving in initial cost, and a further saving afterwards in the working costs, as the steam consumption would be greatly reduced.

We have already referred to the fact that the appearance of the fracture of pig iron cannot be regarded as a criterion of the hardness or otherwise of the metal, and in a paper recently read before the American Foundrymen's Association, Mr. Thomas D. West dealt with the fallacy of estimating pig iron solely by the fracture. He showed samples of two pigs, one open and the other close-grained. The former, however, gave hard, and the latter soft castings, the opposite of what is ordinarily expected, but a result which anyone acquainted with the analyses of the two specimens would have anticipated. Thus the open grained pig, in spite of its texture, contained only 1·25 per cent. of silicon, whilst the other contained 2·86 per cent, and consequently gave perfectly soft castings. The texture of pig iron is, in fact, affected by the particular conditions under which it has been melted or cast, as well as by its chemical composition.

Official returns published by the Government of the North-West Territories show the output of coal in that section of the Dominion in 1898 to have been:

Bituminous coal	315,661 tons.
Anthracite "	23,000 "
Persons employed	832

In the paper on "Improvements in Coal Mining," read last month before the Institution of Civil Engineers, Mr. H. W. Martin showed that an important object in the design of winding machinery is to make the demands on the power of the engine as nearly uniform as possible. Many devices are resorted to in order to effect this, and are more or less successful. Two of these are (1) The employment of a balance rope, and (2) The adoption of a drum of varying radii, generally of a conical form. Both of these appliances are well known, and have long been in use. Balance ropes for deep winding, however, have not been extensively adopted, and where used have not always been successful, although they are now more or less returning to favor. The objections urged against this management are the extra strains on the caps or sockets of the winding ropes and the increase of friction due to their weight, but the greatest difficulty probably has been found in guiding the balance rope at its return to the bottom of the shaft. Pulleys revolving in sliding bearings and other means have been used for the purpose, but the author considers the most effective method, and the one he adopts, is to use a specially-made flexible and untwisting steel wire rope guided sideways at the return by two verticle parallel plane surfaces only, between which the rope is allowed to assume a free path. The radii of drums are often more or less proportioned, so that the moments of resistance due to the load are constant throughout the wind, and this arrangement is very extensively used, with considerable success. It is, however, high in first cost, and there is an increase of friction due to the extra weight of the drum. There is also a larger mass to be set in motion and brought to rest than is the case with a cylindrical drum and a balance rope. The author gave the main features of the winding machinery used by himself at a new colliery in South Wales, and expressed his preference for the balance rope and plain drum, but the quality of the rope must be as good as that of the winding rope.

CORRESPONDENCE.

The Silver-Lead Deposits of the Slocan—A Correction.

SIR,—I notice in THE CANADIAN MINING REVIEW for July that you have a reprint of an *unrevised* copy of my paper on the Silver-Lead Deposits of the Slocan. At the time this unrevised copy was issued I had not seen a proof, and was therefore unaware of the errors and departures from the original it contained. These were corrected on the proof received by me afterwards, so that when the paper is finally issued to members, it will, I hope, convey exactly what I intended to say. One mis-statement of fact I may here mention. The duty on lead in base bullion sent into the United States is put at 2½ cents per lb.; it should have been 2⅛ cents.

Perhaps you will be good enough to print this letter in your next issue, and oblige.

Yours faithfully,

J. D. KENDALL.

VANCOUVER, B.C., 8th July, 1899.

Iron and Steel Bounties.

The following returns of the bounties paid by the Dominion Government on pig iron, steel billets and puddled bars produced in Canada have been carefully compiled from the various reports of the Auditor General.

Summarized they show an expenditure on:—

Pig Iron	$952,487.75
Steel Billets Ingots	144,318.71
Puddled Bars	19,432.15
Total to 30th June, 1898	$1.116.238 61

In detail the figures are:—

Bounties Paid on Pig Iron.

The following are the amounts paid to the companies under this authorization:—

1884	$44,090
1885	38,655
1886	39,270

	1887.	1888.	1889.	1890.	1891.
Steel Co. of Canada	$ 31,164.01	$ 18,642.62			
Steel Co. of Canada, withheld pending settlement with I. C.R.	22,033.09				
George Macdougall	1,139.87	1,214.01	$ 1,109.03	$ 523.49	$ 1,376.66
Londonderry Iron Co		7,701.53	30,626.35	21,585.64	15,849.81
John Macdougall & Co	5,239.19	5,756.25	5,498.24	3,588.14	2,926.58
	$59,576.19	$ 33,314.41	$ 37,233.62	$ 25,697 27	$ 20,153.05

	1892.	1893.	1894.	1895.	1896.
Londonderry Iron Co	$ 26,066.24	$ 49,906.13	$ 49,043.10	$ 13,045.98	$ 45,472.13
Can. Iron Furnace Co	2,150.71	12,973.39	15,077.51	12,581.60	11,215.24
Nova Scotia Steel Co					42,470.50
New Glasgow Iron, Coal and Ry. Co.		25,871.28	55,269.00	33,695.00	
Pictou Charcoal Iron Co		1,420.00		3,440.00	
Hamilton Blast Fur. Co					7,201.97
Macdougall & Co	2,077.42	3,725.68	5,654.88	621.37	3,356.17
	$ 30,294.37	$ 93,896.48	125,044.49	$ 63,383.95	109,716.01

To 30th June, 1897.

Canada Iron Furnace Co	Radnor, Que	$ 14,211.27
Hamilton Blast Furnace Co	Hamilton, Ont	7,575,68
Londonderry Iron Co	Londonderry, N.S.	7,070.85
Nova Scotia Steel Co	Ferrona, N.S.	37,650.89
Total to 30th June, 1897		$ 66,508.69

To 30th June, 1898.

(Production for June, 1898 not included).

Canada Iron Furnace Co ($21,804.29).

Produced in 1896-7:—

715.04 tons from Canadian Ore at $2.00 ..... $ 1,438.08

Increased Allowance (61 *Vic. C.* 11.

1589 tons from Canadian Ore at $1.00 ..... 1,589.09
88 " " Foreign Ore at $2.00 ..... 176.00

Produced in 1897-8:—

6163.86 tons from Canadian Ore at $3.00 ..... 18,491.58
58.77 " " Foreign Ore at $2.00 ..... 117.54

Hamilton Blast Furnace Co ($90,610,43).

5,425.97 tons from Canadian Ore at $3.00 ..... 16,277.91
37,166.26 " " Foreign Ore at $2.00 ..... 74,332.52

Nova Scotia Steel Co ($48,127.27).

5,693.296 tons from Canadian Ore at $3.00 ..... 17,079.88
15,523.696 " " Foreign Ore at $2.00 ..... 31,047.39

John McDougall & Co. ($5,112.26).

1.704.087 tons from Canadian Ore at $3.00 ..... 5,112.26

Total Paid to 30th June, '98 ..... $165,654.25

Bounties Paid on Steel Billets.

By order in Council under date of 22nd June, 1895, the Dominion Government granted a bounty of $2.00 per ton on all steel billets manufactured in Canada from Canadian ore. As already stated this bounty was increased in April, 1897, to $3.00 per ton. The following amounts have been paid to the 30th June, 1898:

Nova Scotia Steel Co.

1896.	Received for steel manufactured from 27th March, 1894, to March 1st, 1896		$ 56,925.26
	Received for steel manufactured from 1st April to June 1st, 1896		4,393.26
	Total		$ 61,318.52
	Less refund for bounty on 910 tons, the product of 1,218 tons, 1,844 lbs. of foreign pig		1,820.00
	Total paid in 1896		$59,498.52
1897.	Received for July and August, 1896		$ 2,714.75
	Paid for steel made November 1st to April 23rd, 1897		14,651.41
	Total paid in 1897		$ 17,366.16
1898.	Received for March 1896 on 1,201.583 tons at $2.00		$ 2,403.15
	June, 1896, on 422.265 " "		844.73
	Sept.-Oct., 1896, on 2,497.60 tons at $2		4,995.20
	April 23-30, 1897, on 266.136 " "		532.27
	May ——, 1897, on 961.441 " "		1,922.88
	June 1-28, 1897, on 1,189.017 " "		2,374.04
			$ 13,072.28
	Less balance as per adjustment:		
	Over-payments on production from July 1, 1895, to May 31, 1896	$ 1,849.93	
	Less amount refunded in error in 1896	1,820.00	29.93
	Total paid in 1898		$ 13,042.35

Bounty on Steel Ingots.

Nova Scotia Steel Co. on production from June 28, 1897, to 31st May, 1898, 18,137.227 tons, at $3.00 ..... $ 54,411.68

Bounties Paid on Puddled Bars.

By Order in Council under date of the 24th February, 1896, the Dominion Government granted a bounty of $2.00 per ton on all puddled bars made in Canada from Canadian ore. As stated, this was increased in 1897 to $3.00 per ton. Under this appropriation the following amounts have been paid to 30th June, 1898:—

Londonderry Iron Co.—Received prior to 30th June, 1896, on puddled bars ..... $ 8,352.32
1897—Received on do. to 30th June 2,914.36
Total to 30th June, 1897 ..... $ 11,266.68

Pictou Charcoal Iron Co.—Received prior to 30th June, 1896, on puddled bars ..... $ 172.00

Ontario Rolling Mills Co.—Received prior to 30th June, 1896, on puddled bars ..... $ 183.23
1897—Received to 30th June 104.46
Total to 30th June, 1897 ..... 287 69
$ 11,726.37

——1898——

Londonderry Iron Co.—707.797 tons from Canadian ore ..... $ 2,123.39
Ontario Rolling Mills—1,860.797 tons from Canadian ore at $3.00 ..... 5,582.39
Total to 30th June, 1898 ..... $ 7,705.78

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Winding.

Reproduced by permission of the South Wales Institute of Engineers from a Lecture by PROF. W. GALLOWAY, M.E.

The operation of winding or raising minerals from the workings of a mine to the surface is carried on in both inclined and vertical shafts by means of a more or less complex system of appliances. Amongst these the engine, together with the drum and the rope, which is alternately coiled upon and uncoiled from it, constitute the only absolutely essential parts of the apparatus; but in proportion as the depth of the shaft and the quantity of mineral to be raised within a given time increase, so do the magnitude and, up to a certain point, also the number of the appliances. I propose in this place to consider only a complete winding outfit for a vertical shaft.

Ropes.—Up to the beginning of the present century ropes made of hemp fibre were exclusively employed in winding, but thereafter chains were substituted on account of the high price of hemp. In 1834 round ropes made of iron wires were introduced into the matalliferous mines of the Hartz in Germany, and were soon adopted nearly everywhere

Flat ropes of hemp or aloe fibre are largely used in Belgium and the north of France. Flat ropes of iron or steel wire are used in a number of collieries in various localities, but round ropes being cheaper and more durable, are preferred.

An ordinary wire rope is usually built up of six strands twisted helically around a centre core of tarred hemp or wire. Each strand consist of a certain number of wires also twisted helically around a core of the same nature as the principal core. A strand may consist of a single covering of wire on the core or of a double covering, that is to say, after the first wires have been wound on the core the second wires are wound on the first ones. In this way a rope may consist of, say, six strands, and each strand of seven wires; or it may have the same number of strands and each strand with nineteen wires, or more or less. The spiral described by the strands is about eight times the diameter of the rope, and that of the wires in a strand from eight to twelve times the diameter of the strand.

The object of twisting the wires together is to impart unity to the assemblage. This is done at a sacrifice of from 15 to 30% or more of the aggregate strength of the wires of which the rope is composed.

A locked-coil rope consists of an internal core of round wires twisted together to form a strand and covered successively by two or three complete cylindrical sheaths of wires, one over the other. The innermost sheath is quite independent of, although closely pressing upon, the core which it encloses, and each succeeding sheath similarly presses upon, and completely encloses, the sheath below it. The core can slide longitudinally inside the first sheath, and similarly each sheath can slide upon the one which it encloses. The wires of which each of the inner sheaths is composed are shaped like vousso irs, so that while they closely fit against each other sideways, they present a smooth surface in the interior and on the exterior of the cylinder. The wires of the successive sheaths are twisted as shown in Fig. 5, so that when the

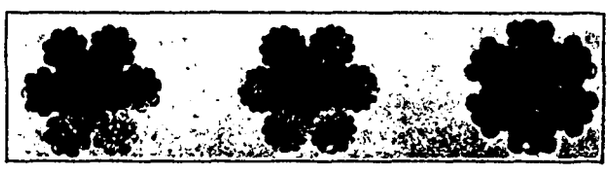


FIG. 1. FIG. 2. FIG. 3

rope is in tension its ends have no tendency to turn around one way or the other, in the same way as those of a round rope of ordinary construction. The wires which constitute the outermost sheath are shaped like a letter S, so that they lock each other when in place, and hence the name applied to the rope.

Flat ropes, whether of hemp, aloe iron or steel, consist of several pairs of round ropes sewn together side by side. The individual ropes of each pair are twisted in opposite directions. Great care is necessary in the process of manufacture to put exactly the same amount of tension upon each constituent rope while it is being sewn to the adjoining rope. One end of each winding rope is fixed to the drum or reel by means of glands, and its length is taken such that when its free end is at the bottom of the shaft, there are several spare coils on the drum.

FIG. 4. FIG. 5.

SECTIONS OF WINDING ROPES—HALF NATURAL SIZE.

Figs. 1 and 2. Ordinary construction. Fig. 3. Flattened strand. Fig. 4. Locked coil. Fig. 5. Locked coil, showing; *a*, central wire; *b*, *c*, *d*, sheaths of round wires all twisted in one direction; *e*, *f*, sheaths of voussoirs twisted in the opposite direction to *b*, *c*, *d*; *g*, outer sheath of S wires twisted in the same direction as *a*, *b*, *c*, and locking each other.

Rope Caps.—The free end of a winding rope is provided with a cap, by means of which it can be easily and quickly attached to the load. There are several kinds of caps and several ways of attaching them to the rope. One of the best, if not the very best, known method of capping a round winding rope is to bind it tightly with iron wire at a distance of two or three feet from the end, then to set free the whole of the wires between the binding and the end, and to turn them back one by one over a conical wedge, cutting a certain length off a certain

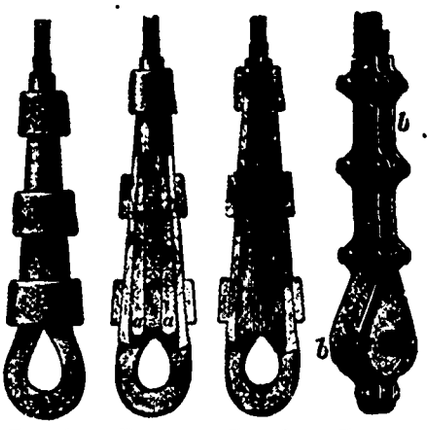


FIG. 6. FIG. 7. FIG. 8. FIG. 9.

CAPS OF ROUND AND FLAT WINDING ROPES.

Fig. 6. Rope with complete cap. Fig. 7. Section showing *a*, *a*, the conical wedges. Fig. 8. Cap partly removed to show wires turned back over the conical wedges. Fig. 9. Cap for flat rope; *a*, cast-iron block; *b*, *b*, glands.

number of them so that when they are all turned back and pressed against the rope they, together with the conical wedge form a conical mass. The cap consists of two semi-circular hollow pieces of wrought iron, which, when brought into juxtaposition at their edges, form a hollow cone of the same internal dimensions as the conical mass at the end of the rope. They are connected together at their wider ends by a square or round bar of iron of sufficient strength to carry the load. When the rope is ready to receive the cap the bar is heated to redness. The two halves of the cap are thereupon closed upon the cone of wires, and several stout rings of bar-iron (Figs. 6, 7, 8) of decreasing diameter, which had been strung on the rope before the operation of forming the

cone commenced, are hammered tightly down over them so as to press them tightly against the cone of wires. The rings are secured by small set-pins. The bar which connects the two halves of the cap is taken of such a length that when the cap has been secured it forms a semi-circle loop large enough to receive the pin of a shackle which forms the first connecting link between the rope and the cage. Mr. Becker, of Messrs. Geo. Elliott & Co., has lately patened an improvement in the construction of caps, which consists in introducing a hinge in the bar between the two halves of the cap, so that there is no necessity for heating it. The cone can also be examined at any time by simply pulling back the rings and opening the cap.

Caps for flat ropes consist of a pear-shaped block of cast iron (*a*, Fig. 10) round which the rope is folded back upon itself. Two long glands *b*, *b*, are then bolted together with the double part of the rope and the pear-shaped block between them. The last-named block has a hole in it to receive the pin of the shackle to which the load is suspended.

The weight in pounds per yard and the breaking strain in tons for ropes made of various substances are determined by experiment, and are usually given in great detail in every rope-maker's circular. With these data it is easy to ascertain, first, the number of yards of any particular kind of rope whose weight is equal to its breaking strain, and secondly, the weight per yard of a rope required to raise a given load.

For instance, by dividing the number of tons which is equal to the breaking strain by the weight per yard, we find for:

Tarred hemp	8,300	yards.
Iron wire	12,000	"
Steel wire	15,000	" or more.

and if we take one-tenth of the breaking strain as the co-efficient of safety for winding ropes these figures become:

Tarred hemp	830	yards.
Iron wire	1,200	"
Steel wire	1,500	"

Denoting the last found figures by the letter *s* and making

Q the useful load,
q weight of cage chains and empty waggons,
D depth of shaft in yards,
x Weight of rope per yard,

we have

$$Q \times q \times x\,D = xs,$$

or

$$x = \frac{Q \times q}{s - D}$$

in which the value of *x* depends upon the value assigned to *s*.

Safety Hooks.—When a safety hook is employed it is attached to the car by two shackles.

Two kinds of safety hooks deserve special mention.

Walker's Detaching Hook (Figs. 10 and 11) is constructed, and acts, as follows:—The rope is attached to the shackle A, and the load to the link B. The ring C, which is a flat steel plate, is fixed to balks or girders under the winding pulley on the headgear. This hook consists of a pair of jaws (DD) connected by a pin in such a manner that the weight of the load tends to open them and release the shackle A. The upper limbs, which are provided with external hooks (FF), are kept together, and made to retain between them the shackle A by means of the steel clamp H. The latter is held in position by the upper pair of the four pins shown through the opening in it. When an overwinding takes place, the hook enters the hole in the steel plate C, until the projections of KK of the clamp H come in contact with its under-side, when the clamp is arrested. The rivets are shorn off by the continued upward movement of the hook, and the clamp, coming in contact with the lower limbs, presses and locks them together, at the same time opening the upper limbs, releasing the shackle A, and thrusting the hooks FF, which are *above* the centre of the hook, over the edges of the plate C.

King's Detaching Hook (Figs. 12 and 13) accomplishes the same object in a similar manner. It consists of two plates *a a* which over-

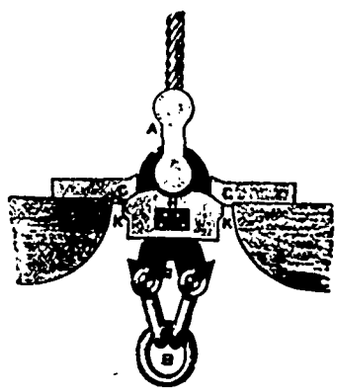


FIG. 10.

FIG. 11.

lap, and are connected to each other and to two other plates *b* which enclose them and constitute a fixed case by means of a centre pin *c* upon which the inner plates can turn freely. A steel plate *d* with a round hole in it, large enough to allow the upper end of the hook, including the upper end of the case, to pass freely, is fixed in the headgear as before. The pin of a shackle *e* attached to the cap of the rope is held between the upper limbs of the moveable plates, and the load is attached to the case by the shackle *f*. The lower limbs project to such a distance from their common axis that they cannot pass through the hole in the fixed plate without coming in contact with its lower edge.

A copper rivet (*g*), which passes through the four plates just below the central pin, keeps the moveable plates in position, and causes them to retain their hold of the shackle. When an over-winding takes place the lower limbs *a a* of the moveable plates come in contact with the lower side of the fixed plate, and are pressed downwards and inwards, the copper rivet is shorn through, the upper limbs open and release the shackle, and external hooks *h h* on the upper limbs, which are *below* the centre of the hook, are thrust outwards over the edges of the fixed suspending plate *d*, as in the case of Walker's Hook.

FIG. 12.

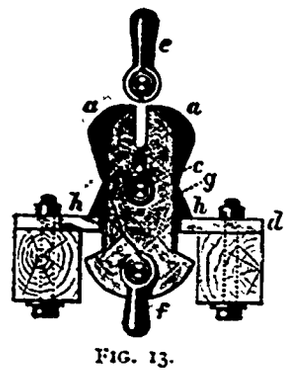


FIG. 13.

Adjusting Screws.—Up till quite recently the length of winding ropes was adjusted by moving the spare coils on the drum and re-fixing the rope, or by re-capping. It is, however, impossible by this means to obtain an exact adjustment of the length without a great amount of labour and care, and for this reason adjusting screws are now being introduced between the safety hook and the load. The best form of adjusting screws (Fig. 14) which have been hitherto made were first employed in Germany. They consist of a strong steel rod *a* terminating in an eye above and below. The shackle at the bottom of the safety hook is attached to the upper eye. A round block *b* with a hole in each end large enough to admit of the easy passage through it of the screws *c c* is placed in the lower eye.

A screw *c*, two and a half or three feet long, with strong threads, with an eye at its lower end, and with a nut *d*, screwed on to it is passed through each hole in the block, and a nut *e* is then screwed on to it from above. Each nut *e* while resting on the block supports its own screw. Two triangular plates *ff*, with a hole at each angle, are attached

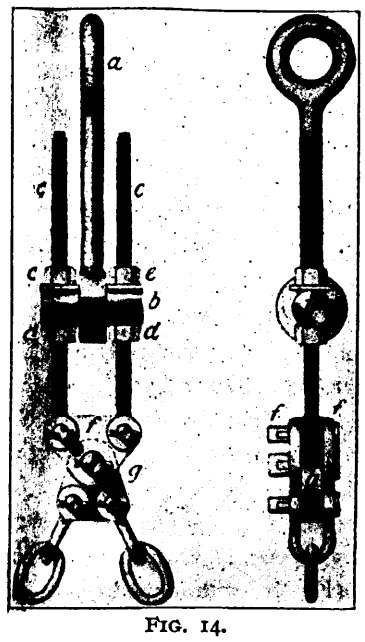


FIG. 14.

by means of pins passing through two of their holes to the eyes of the lower end of the screws, which they then enclose between them. The third eye in each of these plates hangs vertically below the steel rod which supports the block. A third triangular plate *g*, with three holes, one at each angle, is inserted between the two first, and a pin is passed through one of the holes in it and through the unoccupied holes in the triangular plates first referred to. Two short pieces of chain are attached to the remaining two holes of the lower triangular plate by means of shackle, and the cage is attached to these chains. The object to be attained by being able to adjust the lengths of the ropes quickly and exactly will be shown presently.

Cages.—For the sake of economy in first cost, it is desirable to design cages so that they can be constructed almost entirely of rolled steel, in the form of angles, channels and plates (Figs. 15 and 16). The floor and roof are made of sheet steel, and the sides may be closed either with thin sheet steel or strong wire gauze, which is lighter than sheet steel. Rails are fixed to the floor to receive the waggons.

Catches.—Various kinds of catches are employed for retaining the waggons on the cage during its transit up and down the shaft. Fisher's automatic catches (Fig. 17) are by far the best of any that have been invented up to the present time. They consist of four heavy rectangular bars of iron *b b*, each about two feet long, placed in pairs, one pair at each end of the cage parallel with and between the rails (Fig. 16). Each bar is supported by a bracket *h* with a horizontal pin in it, which passes through a hole in the bar a little nearer its inner end than its outer end, and maintains it at such a height that when its

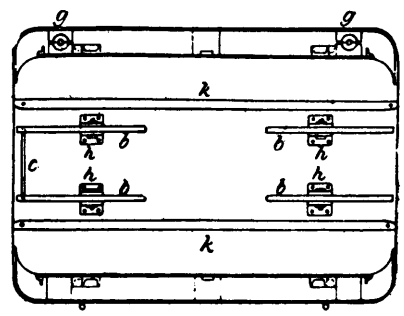


FIG. 16. PLAN OF CAGE.

b b, Catches. *c*, Plate attached to left-hand catches. *h h*, Brackets supporting catches. *g g*, Guide-rope shoes. *k k*, Rails.

heavier, because longer, portion falls down so that its outer end rests on the floor at the end of the cage, the middle point of its opposite end is on the same level as the centre of the axle *a* of the waggon. The bars can turn freely in vertical planes parallel with the side of the cage, and their length is taken such that when a waggon is standing symmetrically between the opposite pairs their inner ends are almost touching the axles. Thus when a waggon is pushed on to the cage

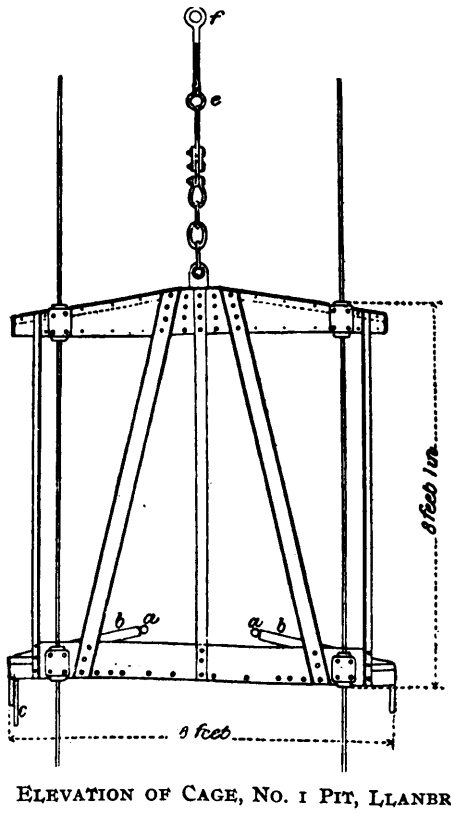
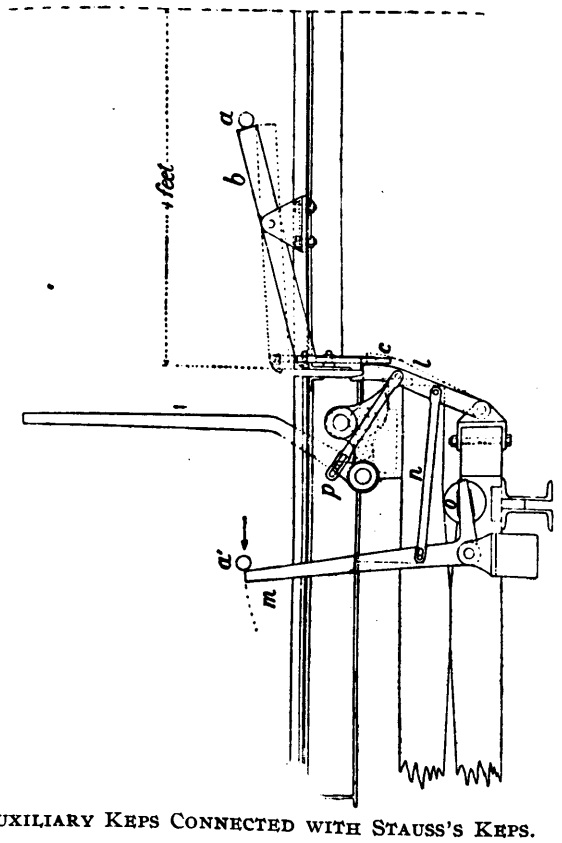


FIG. 15. ELEVATION OF CAGE, NO. 1 PIT, LLANBRADACH.

a a, Axles of waggons; dimensions of waggon, 7 ft. long, 4 ft. wide, inside measurements; capacity 2 tons. *b b*, Fisher's catches. *c*, Plate attached to end of catches and hanging down through slot in bottom of cage. *e*, Adjusting screws. *f*, Ring to which safety hook is attached.



AUXILIARY KEPS CONNECTED WITH STAUSS'S KEPS.

The axle *a'* has pushed the lever *m* far enough before it to release the plate *c*, which has fallen together with the catch *b*, and the axle *a* of the next waggon has been arrested.

from either side, its axles come in contact with and depress the raised ends of the two bars nearest the end of the cage from which it is approaching, and it is free to pass into the cage until its front axle comes in contact with the ends of the bars at the opposite end of the cage, when its progress is arrested. Just before this happens the hind axle passes over the ends of the bars that have been depressed, and the latter fall into their natural position, barring the return of the waggon. For the purpose of rendering these catches automatic at the top and bottom of the pit, the two bars at one end of the cage are connected to a plate *c* which passes through a slit in the floor of the cage, and projects to a distance of a few inches below the bottom. At the top of the pit a light pair of auxiliary keps *l* (Fig. 17) provided for this purpose are placed between the cage keps and arrest the plate *c* while the cage is being lowered on to the latter. This has the effect of raising the outer ends and depressing the inner ends of the bars *b* to such an extent that the axles of the waggon are free to pass over them. As the waggon passes outwards its front axle comes in contact with the upper end of a lever *m* which projects up through a slit in the floor of the roadway and causes it to draw the keps *l* out from under the plate *c* by means of the rod *n*, which are articulated to both. The plate *c*, together with the bars *b*, fall into their normal position and arrest any other waggon, full or empty, which may happen to be following behind the one that has just left the cage. When both axles have passed the lever *m* it is drawn back and the rod *n* is pressed towards the cage by weight *o*, leaving the auxiliary keps *l* free to resume their original position as soon as the plate *c* is out of the way. If the cage rests on a platform at the bottom of the shaft a flat horizontal plate may be substituted for the auxiliary keps, but all the other arrangements remain the same as those that have been described.

The auxiliary keps are connected to the mechanism which works the Stauss's keps by means of a bar *p* with a slot in it, so that when the cage keps are drawn back the auxiliary keps are also drawn out of the way of the cage, and on the other hand the auxiliary keps can be worked inwards and outwards while the cage keps remain stationary.

It is best to arrange matters in such a way both at the top and bottom of the shaft that the waggons always pass into the cage on one side and leave it on the opposite side, and hence I have only shown auxiliary keps for working the catches at one end of the cage; but if it is in any case desirable the same appliances can be used at both ends.

Arrangement of Roadways on the Surface.—The gradient of the road upon which the full waggon enters when it leaves the cage ought to fall not only all the way to the tipping apparatus, but for some distance beyond it. The gradient should then be reversed, or an elevator interposed, and the empty waggon should be drawn up an incline or raised vertically by mechanical means, until it attains a sufficient height above the cage to enable it to run of its own accord round to the back of the shaft. In this way a great saving of manual labour can be effected as compared with the hitherto common method of pushing the waggons all the way by hand. The amount of fall per unit of distance depends on the friction of the waggons and the radius of the curves on which they have to run, but it may be made 1 in 35 or 40 as a rule. The steepness of the rising gradient depends upon the nature of the mechanical appliances employed for raising the empty waggons. It is probable that in all new collieries, mechanically actuated revolving tipping appliances, such as I introduced at Gawun-Cae-Gurwen and Llanbradach Collieries, will be adopted in the future on account of the little labor attached to their use and the gentle manner in which they deposit the coal on the screens Besides, in appliances of this kind the full waggon drives out the empty one in front of it, so that the latter acquires momentum from the former. The general arrangement of the roadways is shown in the following sketch (Fig. 18), which represents the system which I introduced at Llanbradach.

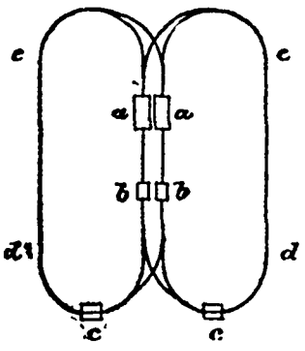


FIG. 18.

a a are the cages; *b b* weighing machines; *c c* revolving tippers; *d e* inclines up which the waggons are drawn by a constantly moving chain.

Only one side of the shaft was actually provided with these appliances, but they worked so perfectly that three men and a boy, including the banksman, were able to handle 800 tons per day in waggons containing on an average, two tons each, without any special means of loading and disloading the cages.

The construction of the chain which pushes the waggons up the incline *d e* is shown in the Figs. 19 to 24. At intervals of 12 or 15 feet a small carriage (Fig. 19) with four wheels is clamped to the chain. The chain with its carriages comes up through the middle of the floor between the rails, at the point where the gradient changes. The wheels of each carriage are guided into the grooves formed by the channel irons *a a*, as shown in Figs. 20, 22, and 23, and the carriages travel slowly up to the top of the incline, where they pass over a pulley between the rails and return to their starting point under the floor of

FIG. 22. FIG. 23.

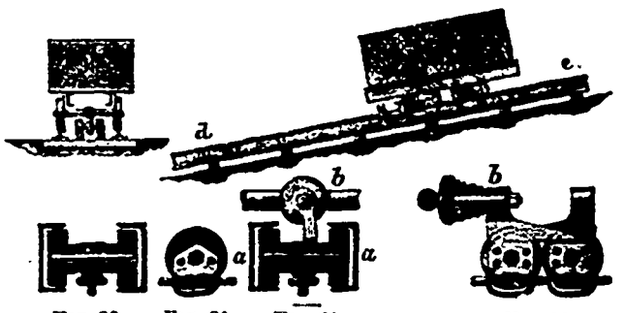


FIG. 22. FIG. 21. FIG. 20. FIG. 19.

the road. Each carriage has a buffer *b* fixed on it at the height of the centre of the axles of the waggons.

The chain, with its carriages, passes round the driving pulley, the tightening pulley with a weight attached to it. and the pulley at the opposite end of the incline, without any derangement, and each carriage comes up in the proper position for entering the grooves. I adopted the same kind of chain at Gwaun-Cae-Gurwen Colliery eight years ago for pushing full waggons and bringing back empty waggons on a gantry 450 feet long, and both that chain and the one at Llanbradache Colliery have worked without a hitch, so far as I know, ever since their introduction.

Arrangement of Roadways at the Bottom of the Shaft.—It is desirable that there should be storage sidings for both full and empty waggons at the bottom of every winding shaft, so that the operation of winding can be carried on uninterruptedly although the full waggons may arrive intermittently, and that the full waggons should all enter the cages from one side of the pit and the empty waggons be driven out at the opposite side. The sidings for full waggons should slope towards the shaft with a gradient of 1 in 70 or 80, more or less, according to the rolling friction of the waggons, and those for the empty waggons should slope away from the shaft with a similar or rather greater gradient

Inasmuch, however, as the empty waggons must sooner or later be brought up to the same level as the full waggons, it becomes necessary at a certain distance from the shaft to reverse the gradient on the empty road.

This road must also usually describe a curve so as to bring the empty waggons round the shaft to the point from which the haulage system commences at the inner end of the storage sidings. This object may be effected in various ways, according to the position of the shaft in relation to the level course of the seam, the existance of boundaries or faults near the shaft, the nature of the hauling appliances, and so on.

Fig. 25 shows the roadways and airyways in the little rock seam of Llanbradach Colliery, from which the coal is raised in the up-cast shaft. The empty waggons pass round the curve *b* to a lowest point *c*; they are thence drawn by a continually working endless rope to a highest point *d*, from which they run by gravitation into the various headings, passings under the roads along which the full waggons are approaching the shaft. The roads for empty waggons are shaded. The arrows show the direction of the air currents, which will be referred to again in the lectures on ventilation.

Loading and Disloading Cages.—The more rapidly the empty waggon standing on the cage at the bottom of the pit can be replaced by the full one, and the full waggon standing on the cage at the top of the pit by the empty one, the greater is the number of waggons that can be raised in a day's work.

Of these two operations, that of driving out the full waggon in front of the empty one at the top of the pit is the more difficult. For this reason, as well as with the object of economising manual labor,

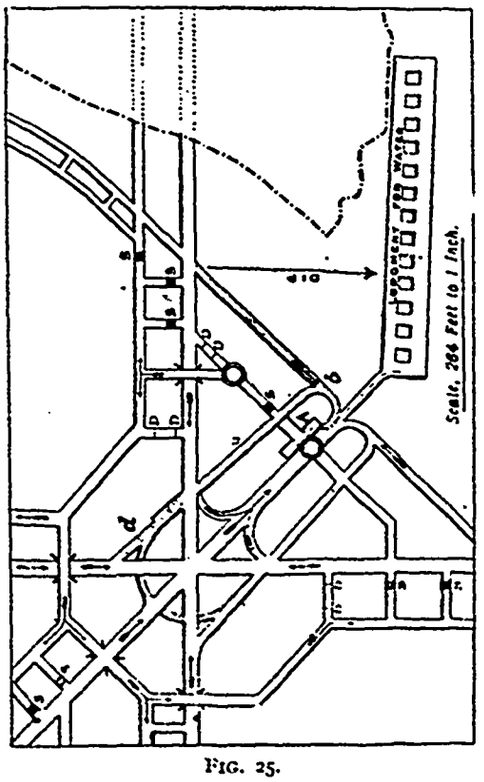


Fig. 25.

mechanical contrivances are sometimes employed for doing this work. A hydraulic ram may be made to push the empty waggon against the full one; or the floor of the cage may be made moveable, so that it can be raised at one end when the cage sits down on the keps and assume an inclined position sufficiently steep to cause the waggon or waggons to run out under the influence of gravity.

The second arrangement which is shown in Fig. 26 is the one that has found most favor so far. The empty waggons are placed on rails on a moveable platform resting in a frame on the pit bank, to which it is connected by four arms. When the platform is pushed diagonally upwards towards the shaft from behind, the arms compel it to assume a sloping position, in which the rails on it are continuous with those on the sloping floor of the cage. This is effected by means of the piston of a cylinder on trunnions placed below the end furthest from the shaft, the steam being admitted below the piston automatically by the cage

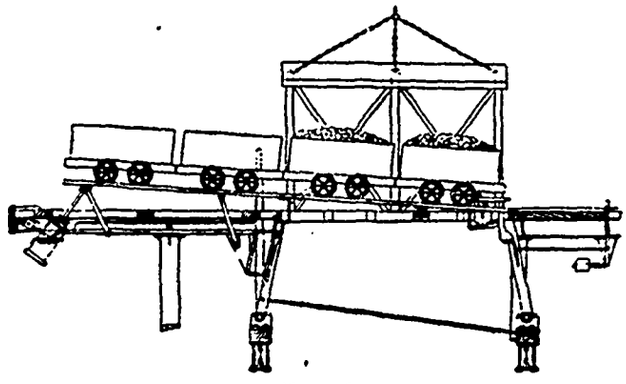


Fig. 26.

while it is descending to rest on the keps. The full waggons run out of the cage and are followed by the empty ones. The latter are arrested by the catches at the proper instant, and the cage is then ready to descend the shaft.

Cages with Two or more Decks.—The operation of loading and disloading cages with more than one deck is effected in several different ways:

1. When the drum is cylindrical, so that both cages move through the same vertical distance during a revolution or part of a revolution, in whatever part of the shaft one or the other happens to be at any given moment, then after the waggons on the lowest deck at the top of the pit and on the highest deck at the bottom have been changed, the cage at the top may be lowered on to the keps so that the next higher deck is brought opposite to the landing place, and this manœuvre brings the next lower deck opposite the landing place at the bottom; and so with the other decks.

2. There may be landing places one above the other, both at the top and bottom of the pit, at the same distance apart as the decks, and then all the waggons can be changed simultaneously. This arrangement is objectionable both on account of the number of men required and of the subsequent operations necessary to bring all the waggons to the same level. According to the arrangement designed by Herr Tomson for the Prussen Colliery, there are four auxiliary cages at the surface raised and lowered by hydraulic rams. Each cage has four decks, and each deck contains two waggons, so that the whole eight waggons are replaced at the same time.

At the Silkstone Collieries, Normanton, the cage with four decks is received at the bottom of the pit on a platform which rests on the top of a vertical hydraulic ram. The waggon on the lowest deck at the bottom, and that of the uppermost deck at the top of the pit, are changed first; the ram is then allowed to descend with the platform and the cage until the second lowest deck comes opposite to the landing place, and so on until all the waggons are replaced. In this way the manœuvres at the top and the bottom can be carried out to some extent independently of each other.

Keps.—When keps of the ordinary construction are employed it is necessary for the engine man to slightly raise the cage before the keps can be drawn out. There are several objections to this:

1. The engineman moves his reversing lever to raise the cage, the banksman withdraws the keps, and signals to the engineman that he has done so. The latter thereupon again moves his reversing lever into the position necessary to reverse the engine and cause the cage to descend

the shaft. The additional movements of the reversing lever and the change of direction of motion of the drum involve a certain amount of labor and time.

2. When the cage at the top of the pit is raised the rope at the bottom of the pit is lowered, and the chains to which the cage at the bottom of the pit is attached become slack, so that when the engine is reversed, with the object of lowering the cage at the surface into the shaft, the rope and the chains in the pit receive a jerk which tends to deteriorate them.

3. Short lengths of each rope, both on the drum and on the pulley, are bent twice as often as the remainder of the same ropes, and this again tends to shorten their lives. This objection is to some extent, but not altogether, overcome by re-capping the ropes from time to time at intervals of one or two months, at the same time cutting off a yard or two from the ends of the ropes and obtaining the additional lengths required from the spare coils on the drum.

Keps of various kinds have been devised, and are coming rapidly into use on the Continent, which can be withdrawn from under the cage without requiring it to be raised up in the first place—and thereby overcoming all the objections to the ordinary keps that have been named above. Amongst these I shall describe three of the most efficient.

Hydraulic Keps.—In common with all other kinds of keps, hydraulic keps are supported on horizontal beams fixed in the shaft at the requisite distance below the level at which the cages are to be supported while they are being loaded and disloaded. These beams are parallel with the shorter ends of the cages and are placed at such a distance apart as to allow the cages to pass freely up and down the shaft between them. When the keps are in position to receive the cage they project beyond the inner edges of the beams to such a distance that the cage must necessarily come in contact with them; and they are always constructed in such a way that when the cage comes in contact with them in passing upwards they are free to be driven backwards out of the way and allow it to pass, but immediately fall forward again of their own accord, and prevent it from descending. Each cage is usually supported at four points, two at each end. The keps of each cage are connected together by means of levers, rods and cranks, and can be pushed into position or drawn back simultaneously by the action of a single lever on the landing stage, placed conveniently to the banksman.

Conceive it possible that when a cage which has been supported on ordinary keps is ready to descend the shaft the four arms sink slowly through the supporting beams in the direction of their own length, until the ends of the two opposite pairs have receded far enough from each other in a horizontal direction to allow the cage to pass downwards between them: and that, as soon as the cage is past, they return to their original position, and you have then a clear idea of all the movements provided for in hydraulic keps.

Instead of four rigid arms we have four short cylinders *b b* (Fig. 27), each provided with a stuffing box and plunger *c*. Hinged to the top of

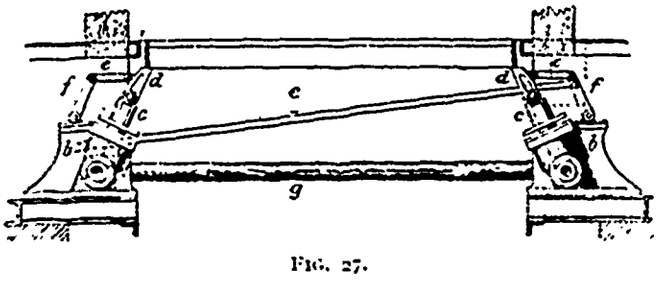


Fig. 27.

each plunger is a moveable piece *d* which represents one of the four arms of an ordinary set of keps. The four moveable pieces are connected together by means of rods *e e* and levers *f f*, and move inwards and outwards simultaneously like the arms of ordinary keps. The cylinders are connected to each other by a pipe *g*, common to all four, which also communicates with the cylinder of an accumulator. There is a stop-cock on this pipe which can cut off communication with the accumulator. The cylinders, the pipe, and the accumulator are filled with water, or better still, with vaseline oil, which remains liquid down to a temperature of—15° Fahr. The axes of the cylinders, the plungers, and the moveable pieces when in their normal position slant upwards from the supporting beams towards the four points, at which the bottom of the cage receives its support

The pressure exerted by the plunger of the accumulator must be sufficient to force the plungers of the four small cylinders out to their highest position when there is no weight upon them. On the other hand, the weight of the empty cage is sufficient to press the four plungers into their respective cylinders and raise the plunger of the accumulator.

Suppose the four plungers to be in their highest position (Fig. 27) and the stop-cock shut. A loaded cage ascends to the top of the shaft, pushes the four moveable pieces *d d* aside, and passes up between them. The latter immediately fall back and the cage is lowered on to, and arrested by them, and the liquid in the cylinders, having no outlet, prevents the plungers from descending. When the full waggon has been replaced by an empty one the stop-cock is opened. The cage descends, pressing the liquid back into the accumulator, until it clears itself from the moveable pieces and continues its course down the pit. After it has passed them the plungers are again forced out, the stop-cock is shut, and the keps are ready to support the cage when it returns to the surface.

Stauss's Keps.—Exactly the same result is attained by means of Stauss's Keps (Figs. 28 and 29), but in a different way. In this case

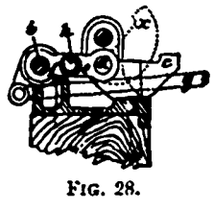


Fig. 28.

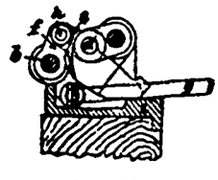


Fig. 29.

two movable cast-iron blocks *c* at each end of the cage are supported on sloping surfaces of cast-iron *l* which rest on the supporting beams fixed in the shaft, in the same way as before. By moving a lever the blocks can be made to project over the edge of the beams far enough to support the cage (Fig. 28), and by the same means they can be drawn back to allow the cage to pass up or down without touching them (Fig. 29). The four blocks are connected to each other by shafts, cranks and rods, and are manipulated by a single lever. When they project over the edges of the beams the ascending cage strikes against them and throws them upwards and backwards out of the way (*x* Fig. 28), but as soon as it has past they fall back into their former position and prevent it from descending. At its end furthest from the cage each block is hinged to two levers *a d* standing vertically above it and to a link *e* standing horizontally behind it. The two vertical levers are attached to a shaft *a* resting in fixed bearings. The horizontal link is attached to one end of a horizontal lever *f* whose other end is attached to a shaft *b* resting in fixed bearings. When the latter shaft is turned so as to raise the lever *f* the link *e* is drawn round the arc of a circle dragging the lower ends of the vertical levers *a d* and the kep block behind it (Fig. 29). But the lower ends of the vertical levers also describe an arc of a circle upwards, and thus while the kep block is drawn backwards its end farthest from the cage is raised and its end on which the cage is resting is lowered The weight of the cage and its contents thus assist in pushing the keps out of the way; but it cannot

do so as long as the horizontal lever and link are in a straight line. The result is that the kep blocks can be easily and smoothly drawn out from under the cage, and the latter then hangs from the rope, and is free to descend the shaft without having to be raised up in the first place.

Daniel and Lueg's Keps.—Four cast-iron supporting blocks *a* (Figs. 30 and 30A) are employed in this case also. They slide forward towards the cage horizontally on level cast-iron plates when coming into the position in which they act as keps and are drawn or pushed backwards horizontally when the cage is ready to descend. In order that the weight of the cage may assist in pushing them back the planes of

FIG. 30.

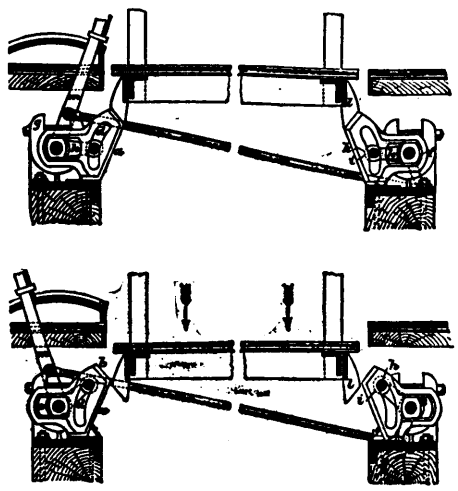


FIG. 30A.

contact between the cage and the blocks *b* and *l*, are inclined downwards towards the shaft. A strong pin *i*, with a revolving sleeve *h* on it, held between the two arms of a double lever *k*, passes through a slot *d* in each block. The two double levers opposite each end of the cage are themselves fixed to shafts *f*, and the two shafts are connected by levers and a rod so that all four double levers can be raised or lowered simultaneously by means of a hand lever *m*. The shafts pass through a second set of slots *c* in the kep-blocks, and each shaft where it passes through the kep-block carries a guide-piece *e* in which it can turn. The guide-piece exactly fills the slot vertically, but the slot is long enough to admit of the block sliding backwards and forwards on the guide-piece to the required extent. The hand lever *m* is provided with a fixing rod which can be lowered into a slot in a quadrant at each extreme position of the kep blocks.

When the cage is arriving at the surface it throws the blocks upwards, and the latter being free to turn on their respective shafts (the pins *i* in the double levers not interfering with this motion), are pushed out of the way until the cage has passed, and then fall back on to their seats. The cage then descends and rests on them, and the pins *i* in the double levers prevent them from being pushed out by its weight. But when the hand lever is drawn backwards the pins held between the double levers describe an arc of a circle upwards and backwards, the blocks are drawn backwards, and the cage helps to push them out of the way.

The saving of labor to the engineman due to the employment of keps such as I have described is not easy to estimate. They relieve him of two manœuvres which may mean about one-fourth of his actual manual labor. The saving of time depends on the exigencies of the pit. Supposing a winding can be done once a minute, or say six hundred windings per day of ten hours, and that only two seconds are saved, the aggregate saving of time will amount to twenty minutes per day. If the amount of coal raised is 1,500 tons in ten hours with the ordinary keps, this means that fifty tons additional can be raised in the same time with the improved keps.

The saving to the ropes cannot be estimated without actual experience extending over a number of years, and even then the varying quality of the materials of which the ropes are made steps in as a disturbing element. It may, however, be safely assumed that this is worthy of being taken into account, more especially the jerk which the rope in the shaft receives at the start.

The employment of adjusting screws is indispensible with keps of this kind, as the ropes must be kept within two or three inches of the exact length at all times.

I adopted Stauss's Keps, together with the adjusting screws, for both of the shafts of Llanbradach Colliery from the commencement, and found them to be all that is claimed for them. The first two locked-coil winding ropes at No. 1 pit of this colliery lasted for seven years, and raised over 300,000 tons of coal each, and I attribute this high efficiency partly to the use of these various contrivances, and partly to the distance of the drum from the shaft (115 feet).

Guides.—It is absolutely necessary to guide the cages between the top and bottom of the shaft. Guides may be made either of wood, wire ropes, or iron, or steel rails. Wire ropes or steel rails are most commonly employed. Wire ropes are suspended from the head gear above the landing place and pass through holes in the platform at the bottom of the pit. They are sometimes made tight by being fixed at the bottom and having tightening screws attached to them at the top. It is better, however, to have weights hanging to their lower ends to provide against the effects of changes of temperature. Rope guides may be made either of six bars of round iron, say ⅜ inch diameter, twisted helically around a straight bar of the same diameter, or a core of stout wire in the form of a strand, or they may be made like an ordinary wire rope with thicker wires than usual in a winding rope, or lastly, like a locked-coil rope also with thicker wires. The guide shoes on the cages ought to be kept as far apart as possible, both horizontally and vertically, so as to minimise the tendency of the cages to oscillate or turn around and thus avoid the resulting undue wear of the guides. They ought also to be made long, so as to present as much

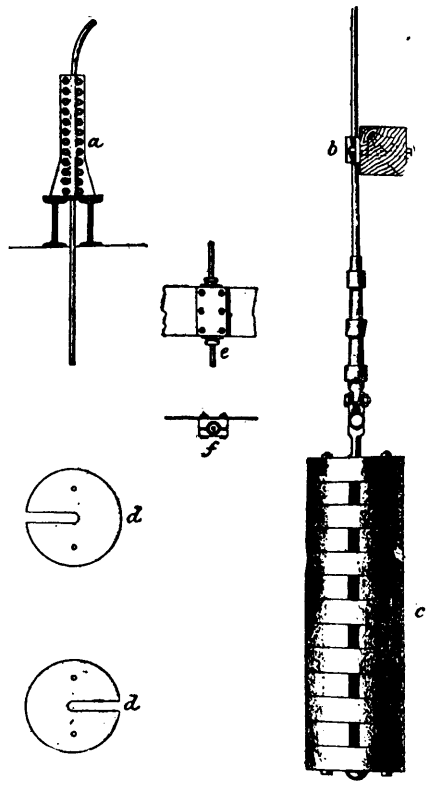


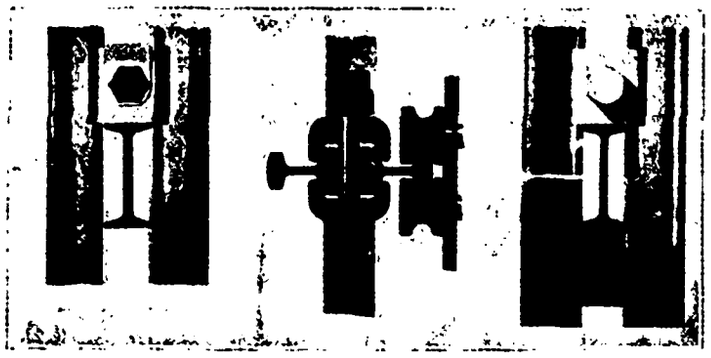
FIG. 31.

WIRE ROPE GUIDES.

a, Clamps resting on joists in the headgear; *b*, loose eye fixed to beam at bottom of shaft; *c*, weight made up of cast-iron blocks *d d*; *e*, elevation of guide shoe; *f*, plan of guide shoe.

rubbing surface as possible (in recent applications I have made them fifteen inches). The wearing parts are best made of thin cast-iron cylinders in two halves with a collar at the top and bottom. These cylinders are clamped between two plates of cast-iron which are fixed to the side of the cage with four or six bolts. It is usual to have two guides between the cages to prevent them from touching each other in passing.

Flat-bottom steel rails are generally employed when it is important to have the guides rigid, as it is, for instance, when the cages work very close to the walling. It is even questionable whether this is not a better solution of the problem than that afforded by means of wire-rope guides, although rail guides are more expensive in first cost and require more time to fix than rope guides. The best example of rail guides known to me is that of La Grange Pit of the Anzin Collieries, in the north of France The H steel joists (buntons or byats) to which the guides are



A. B. C.

FIG. 32.

STEEL RAIL GUIDES, LA GRANGE PIT, ANZIN.

A. Ordinary fastening. C. Fastenings at a joint between two rails, the lower half in section to show the cast-iron block below the joist. B. Plan showing the joist, the cast-iron block above the joist in section, the clamps, the bolt which draws the clamps together, the rails, and the shoe on the side of the cage.

fixed stretch horizontally across the shaft in a vertical plane, which passes through the centre both of the pit and of the winding engine. This pit was entirely re-modelled according to the best engineering practice of the Continent a few years ago, and I was fortunate enough to visit it with M. François, the Director-General of the Anzin Mines, just as it was being completed, and to receive from him copies of the working drawings showing the general arrangement of the guides as well as the details of their fastenings. Special castings are built in the walling of the pit to receive the ends of the joists. The joists are prepared before-hand by planing off one-half the thickness of the vertical web for a distance of about six inches at each end to form a shoulder against the front of one side of the corresponding casting. A wedge is driven in on the other side of the joist at each end to tighten up the thin part of the web against the side of the casting, and the flanges of the joist lie in recesses in the castings. The joist is thus quickly and securely fixed, and cannot move either end-ways, side-ways, or vertically. Recesses, about ⅝ inch deep, are cut on both sides of the flanges to receive the feet of the rail guides and prevent side play. The feet of the two rails -one of which constitutes one of the guides for the cage on one side of the joist, the other for the cage on the other side—are placed in the recesses in the flanges on opposite sides of the joist and drawn towards each other by two clamps, which act like wedges tied together two and two, and press upon the outside sloping surfaces of the feet, so that the more tightly the clamps are drawn towards each other the greater is the pressure of the rails upon the joist between them. To prevent the rails from slipping downwards a cast-iron block, having a circular projection at each end which fits into a circular hole in the bottom of the corresponding rail, is placed upon the joist between the clamps near the end of each rail. At other joists the block is omitted and the clamps are used alone. The cast-iron blocks must fit loosely between both the rails and the clamps when the latter are tightened up. The clamps are drawn towards each other by a single bolt 1·28 inch diameter, which passes loosely through a hole in the cast-iron block. The bolt is provided with a brass nut with a screwed hole at one end only, the other end being closed to prevent the access of air and moisture to the threads of the bolt. The joists are placed at intervals of five feet apart. The rails are thirty feet long and weigh forty pounds per yard. Each rail is supported independently of all the others, and the head of each is rounded off slightly at the end, where a space of one-third of an inch is left between the ends of the next higher or lower rail to allow for expansion. In addition to the rail guides there are also plain wooden guides attached to wooden buntons built in the walling of the La Grange pit, one guide on each side of each cage. But there are no shoes on the cages corresponding to the wooden guides, and the latter appear to be only intended as a precantion in case any thing happens to one or other of the rail guides. The shaft is divided into three compartments by means of boards nailed vertically inside the buntons at the ends of the cages—one for ladders, one for winding, the third for ventilation. The keps are hydraulic. The ropes are flat and made of aloe, with the object of balancing the weight to be raised by the winding-engine.

Headgear.—For the support of the pulleys at a certain height above the landing-place at the surface, towers of masonry or wooden, iron, or steel frames are employed. Steel frames constructed of H joists, angles and plates riveted together are now preferred to any of the others. The pulleys are usually placed at a height of 60 or 70 feet or more above the landing place, with the object of leaving a certain amount of freedom to the engineman in case by any chance he should happen to raise the cage too high. To give stability to the structure and prevent it being drawn towards the winding engine, its base is made wider than is necessary for the accommodation of the cages, and

FIG. 33.

OSTRICOURT.

it is provided with back stays. The latter are usually placed in the plane in which the line of resultant between the vertical parts of the winding ropes and the centre of the shaft of the winding drum lies (Figs. 33 and 34). In Continental installations a cover of some kind

is generally provided to protect the pulleys and the ropes working on them from the weather. The larger the diameter the pulleys can be made the better it is for the durability of the winding ropes. They are usually made of the same diameter as the drum if the latter is cylindrical, and may be made of the mean diameter of a spiral or conical drum, or of a diameter intermediate between the mean and the maximum. The winding drum should be placed at as great a distance from the shaft as can be conveniently managed, and that for two reasons: first, with all kinds of drums, that the length of the bent part of the rope on the pulley may be as short as possible; secondly, with all drums on which round ropes are coiled horizontally inwards from the vertical plane which passes through the groove in the pulley, in order that the angle between the lines in which the rope is stretched when it is fully wound up and fully unwound may be as small as possible. The greater this angle is, the greater is the wear of the rope on itself with a horizontal drum, or on the grooves of a spiral or conical drum, and in both cases on the groove of the pulley, and consequently the shorter is its duration as far as wear is concerned. The larger the diameter of the drum, the fewer the number of coils required for a given depth of shaft and the less the displacement of the rope sideways.

FIG. 34.

LA GRANGE, ANZIN.

It may therefore be stated in the form of an axiom that, other things being equal, the larger the diameter of the drum and pulley, and the further the drum is away from the pulley, the longer will be the duration of the rope.

The Winding Engine.—The all but universal practice of the present day is to place a complete engine on each side of the drum, and to couple the end of each connecting rod to a crank fixed at the corresponding end of the drum shaft.

The eccentrics for working the valves of each engine are placed between the drum and the bearing at the end of the shaft; the cranks are at right angles to each other, and the reversing links are manipulated by means of a horizontal shaft with the necessary levers and connections. By means of a single vertical lever the engineman can control the motions of this shaft. When the engine is large and the valves and their connections difficult to move, an auxiliary engine is employed to do this part of the work; and as the valve of the auxiliary engine is small and easily moved, the effort required on the part of the engineman is small in the same proportion. The auxiliary engine consists of a steam cylinder and a hydraulic cylinder, each with a piston. The axes of the two cylinders are in the same line, and the same piston rod is common to both. A pipe with a stop-cock, or a slide-valve, connects the two ends of the hydraulic cylinder, which is used in the first case simply as a cataract to regulate the speed of the piston in the steam cylinder, and in the second case—that is, when a slide valve is employed—partly as a cataract, partly as a check. The connecting rod at the end of the piston rod may be coupled either directly to the lever which actuates the shaft of the reversing gear of the winding engine, or it may be coupled to a differential lever which actuates both that shaft and the slide valve of the hydraulic cylinder of the auxiliary engine, as in Mellis's patent reversing engine. According to the latter arrangement, when the engineman moves the steam valve lever of the auxiliary engine to any particular position, the steam piston dragging or pushing the hydraulic piston along with it moves in the same direction until the differential lever closes the ports of the hydraulic cylinder and at the same time cuts off the supply of steam to the steam cylinder of the auxiliary engine, when further movement becomes impossible until the position of the valve lever is again altered. I adopted Mellis's differential reversing engine for the compound winding engine of No. 2 Pit Llanbradach, where it has worked successfully from the first.

The two cylinders of the winding engine may be placed either vertically above or below, or in the same horizontal plane, as the drum shaft. In the latter case they are always placed on the side furthest from the pit.

The dimensions of the cylinders are determined by the available pressure of steam, the diameter of the drum, the weight of the load, and the velocity with which the load requires to be raised. Other things being equal, it is better to raise a light load rapidly than a heavy load slowly, since in the latter case everything connected with the winding gear has to be made stronger in proportion, and its first cost is increased in the same ratio.

Take x Weight of rope per yard.
D Depth of pit in yards.
R Radius of the drum in feet
Q Useful load in pounds.
q Dead weight in pounds.
p Available pressure of steam in the cylinders in pounds per square inch.
l Length of stroke in feet.
d Diameter of cylinder in feet.

I shall consider the case of a winding engine with two cylinders whose connecting rods are coupled directly to cranks on the shaft of a cylindrical drum, with two ropes attached to the cages, and without a balance rope under the cages.

The same dead weight q consisting of one cage and its attachments, together with the waggons contained in it, is suspended from each rope, and can therefore be neglected for the present.

The resistance acting through the rope upon the periphery of the drum consists of the useful load and the rope hanging in the shaft, viz:

$$Q \times x\,D.$$

The force acting on the cranks of the drum shaft consists of the pressure of the steam upon the two pistons of the engine, viz:

$$2p\frac{\pi}{4}d^2 144.$$

When the resistance is raised through a height equal to R the semi-circumference of the drum, each piston moves through a distance l to equal the length of its stroke. The force and the resistance will therefore exactly balance each other when the conditions expressed in the following equation are satisfied:

$$(1) \qquad 2lp\frac{\pi}{4}d^2 144=(Q+xD)\pi R.$$

But under these circumstances the engine would not move, and it is therefore necessary to provide a certain amount of surplus force to do the work within the time required If we assume that $\frac{1}{y}$th of the available force will balance the resistance, then the larger we make y the greater will be the surplus power available to do the work. The equation must therefore take the form :—

$$(2) \qquad \frac{1}{y} 144 p \tfrac{\pi}{4} d^2 144 = (Q + xD) \div R,$$

In this equation the expression $2 l \tfrac{\pi}{4} d^2$ represents twice the volume V of the cylinder, or

$$(3) \qquad 2 l \tfrac{\pi}{4} d^2 = 2V.$$

The dimensions of the cylinders cannot be calculated until the numerical values of all the other factors are known, namely, the useful load, depth of the shaft, weight of rope, diameter of drum, and available pressure of steam. It is necessary also to determine the ratio between the diameter and the length of stroke of the piston before we can proceed to solve the equation. We may make the length of stroke any multiple of the diameter we choose, and substitute that value in terms of d instead of l in the equation.

For example, if $l = 2d$ we may write equation (2) thus :

$$(4) \qquad \frac{1}{y} 2 l p \tfrac{\pi}{4} d^2 144 = (Q + xD) \div R.$$

and then simplifying and removing the known quantities to the right-hand side we get :

$$d^3 = y \frac{(Q + xD) R}{144 p},$$

$$\text{or (5)} \qquad d = \sqrt[3]{y \frac{(Q + xD) R}{144 p}}.$$

The value of y in the case of No. 1 winding engine of Llanbradach Colliery is 2·5, and is found in the following way :—

Continuous indicator diagrams (Fig. 35) were taken at the front and back of each cylinder while a useful load of 5180 pounds was being raised. The numerical values of the various symbols were as follows :—

D 792 feet.	d 2 feet.
R 7 feet.	l 4 feet.
Q 5180 lbs.	xD 2115 lbs.

The piston rods (5 in. diameter) are not continued through the back ends of the cylinders, so that the volumes before and behind the pistons when they are at the opposite ends of the cylinders differ from each other to the extent of the volumes occupied by the piston rods. Calling V_1 the volume in front of the piston, and V_2 the volume at the back of the piston, we have in this case :

V_1 = 11·81 cubic feet.
V_2 = 12·56 cubic feet.

The boiler pressure varies from 126 to 150 lbs. per square inch.

When the boiler pressure is at 130 lbs. and the stop-valve full open, the pressure in the cylinder during the first stroke is 114·5 pounds, and the winding takes place in 25 seconds from start to finish.

The drum makes nine complete revolutions with the full pressure of steam admitted to the cylinders, and the momentum thus imparted to the moving masses is sufficient to complete the winding without further admission of steam. It will be seen from the diagrams that the setting of the valves is not equally good throughout, and it follows that an engine of these dimensions might be made to do a little more work, or the same work in rather less time. These considerations do not, however, in any way vitiate the conclusions that will be drawn from the results.

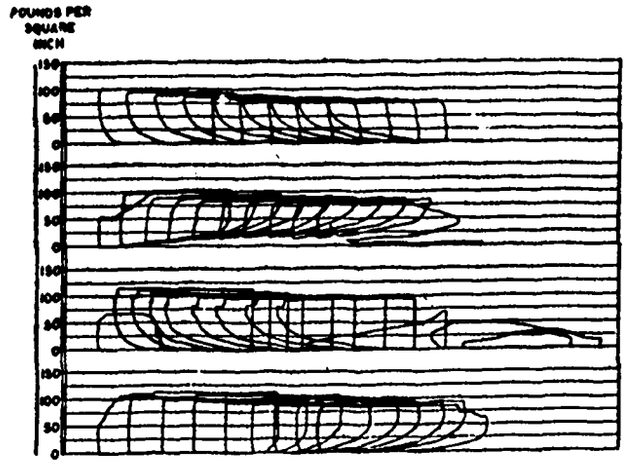


FIG. 35.

It may be mentioned finally that the indicated quantity of steam consumed in each winding under the circumstances described is 108.325 lbs., the indicated work of the steam 6,021,278 foot-pounds, and the useful work 4,102,560 foot-pounds. The space swept through by the pistons in a complete winding is 904·78 cubic feet, and that swept through under steam 452·39 cubic feet. The ratio of the useful work to the indicated work is as 1 to 1·467.

Practically all the work of the steam is done during the first nine revolutions of the drum, although occasionally a little steam may be admitted towards the end of the winding, as shown by the third diagram, when the engineman has slightly miscalculated the velocity and shut off steam too soon.

In the case of this engine equation (3) should for obvious reasons be written :

$$(6) \qquad 2 l \tfrac{\pi}{4} d^2 = V_1 + V_2 ;$$

and if we substitute these values in equation (1) it then becomes :

$$p (V_1 + V_2) 144 = (Q + xD) \div R,$$

and the force and resistance will be exactly balanced when

$$p = \frac{(Q + xD) \div R}{(V_1 + V_2) 144}.$$

Substituting the known numerical values we find that $p = 45{\cdot}7$ pounds.

But we already know that the initial pressure in the cylinder required to accomplish the winding in 25 seconds is 114·5 pounds, and therefore the value of $\frac{1}{y}$ in this case is $\frac{45{\cdot}7}{114{\cdot}5} = \frac{1}{2{\cdot}5}$ and $y = 2{\cdot}5$.

This engine consumes the following indicated quantities of steam, viz. :—35·6 lbs. per indicated horse power per hour; or 52.2 lbs. per actual horse power per hour.

It is therefore seen to be exceptionally economical as compared with the other winding engines mentioned in the following table, for which there are similar data available, when the fact of its being worked without expansion is taken into account.

(To be continued.)

NICKEL EXPORT DUTY.

New Caledonia Supplants Sudbury.

8,000 Tons of Nickel Ore Purchased From the French Penal Settlement, Now Being Delivered in New York as a Direct Consequence of the Foolish and Ill-Advised Agitation of the Toronto Globe.

STARTLING STATEMENT BY MR. R. THOMPSON, PRESIDENT OF THE LARGEST NICKEL REFINERY IN THE WORLD.

Ritchie's Malevolent Mis-Statements Again Exposed.

THREE-FIFTHS OF THE WORLD'S CONSUMPTION OF NICKEL SUPPLIED BY NEW CALEDONIA.

CANADA'S INDUSTRY JEOPARDISED.

There Must be no Export Duty on Nickel.

Just as we go to press we note the publication in the Toronto *Globe* of the 24th instant of the following letter from Mr. Robert M. Thompson, President of the Orford Copper Company, which illustrates, beyond a peradventure, the danger that threatens our Canadian nickel mining industries if the foolish representations of the Toronto *Globe*, and the vindictive utterances of Mr. S. J. Ritchie should result in an export duty being imposed upon our nickel ores and mattes. While, we repeat, there appears to be little danger of the present Administration committing itself to legislation so utterly opposed to the principles of the party it represents—to say nothing of the wisdom of such a policy,—all this foolish talk in its recognized organ is working mischief to one of the most important industries of the country. The facts which Mr. Thompson recites show conclusively that Canada has no monoply of the nickel resources of the world, and that an export duty would seriously cripple the operations of our principal producer, the Canadian Copper Company, to-day the largest metalliferies mining and smelting enterprise in the Dominion. Mr. Thompson says .—

I have to-day received a letter from a friend, stating that he had seen in a late issue of your paper a letter from Mr. S. J. Ritchie, in which he makes the following statement:—

"In my former letter I charged the whole statement with regard to the competition of and the purchase of nickel ore from New Caledonia as a transparent fraud and a bunco game upon the Government. Mr. Leckie does not even attempt to deny this charge, and I again, now and here, confirm all I said upon this matter in my former letter."

If Mr. Ritchie means that the Orford Copper Company has not purchased ore from New Caledonia, he is mistaken. The Orford Copper Company has purchased in all some 8,000 tons of New Caledonia ore, of which about 3,000 tons has reached New York already: 500 tons on SS. Furnessia, arrived May 9; about 350 tons on SS. Buenos Ayrean, arrived May 15; about 150 tons on SS. Ethiopa, arrived May 22; about 600 tons on SS. Anchoria, arrived June 5; about 400 tons on SS. State of Nebraska, arrived June 6; about 600 tons on SS. Furnessia, arrived June 14; about 400 tons on SS. Mongolian, arrived June 21; total, 3,000 tons In addition to this, sailing vessels have been chartered to bring 5,000 tons direct from New Caledonia to New York. This means about 625 tons of fine nickel, and an equivalent of about 3,500 tons of Canadian matte. As near as I can estimate this is equivalent to about 131,000 days' labor, or, allowing 300 days in the year, to a year's labor for 436 men, which would, of course, be distributed over mines, smelters, supplies and transportation.

Canada has lost this business very largely on account of the agitation that is being carried on by Mr. Ritchie. Certain contracts had to made with an absolute guarantee of delivery at a fixed price, and, while I do not believe that the Canadian Government will impose an export duty, yet as long as this agitation was carried on with so much persistence it had to be taken into account as a business risk. No one in Canada was prepared to deliver the material at a guaranteed cost, while the owners of the new Caledonia mines were only too glad to do so. They have not only sold us this ore, but they are pressing more upon us. Mr. Ritchie has for some time been posing as the friend of Canada. I believe Mr. Ritchie has means of obtaining accurate information if he chooses to give it to Canada. If he continues to deny the existence of a formidable competition on the part of New Caledonian as opposed to Canadian nickel—a competition which to-day supplies more than three-fifths of all the nickel consumed in the world—then he must be intentionally suppressing the truth, and trying to deceive the Canadian public. The 436 men who have lost a year's work through Mr. Ritchie's agitation will, no doubt, be deeply grateful to him; and you, Mr. Editor of the *Globe*, must accept your share of the responsibility, because you have assisted in carrying on this agitation and endorsing the statements that have been made, when it is entirely within your power to ascertain the truth, at no cost and at very slight inconvenience to yourself.

When Mr. Ritchie talks about a transparent fraud and a "bunco game" upon the Government, his words sound to me like the ravings of a madman. One does not go into enterprises of the magnitude of an importation of 8,000 tons of ore unless there is money to be made of it. and I can assure you, Mr. Editor, that the Orford Copper Company would not have imported this ore if it could have obtained supplies from Canada on equally good and fair terms. It went into the cheapest and best market, and bought the goods that it required entirely without thought of its effect upon anyone else, and the sooner that Mr. Ritchie comes to appreciate the facts, and tell the truth in regard to them, the better it will be for all concerned.

ROBERT M. THOMPSON,
President of the Orford Copper Company.

New York, July 17.

Bounties on Iron and Steel.

In the House of Commons 13th June, 1899, the minister of finance, Mr Fielding, moved that the House resolve itself into committee to consider the following resolution :

That it is expedient to provide that the bounties on steel ingots. puddled iron bars and pig-iron made in Canada, authorized by chap. 6 of the Acts of 1897, shall on the termination of the period therein mentioned, be gradually reduced during a limited term until they are extinguished, and that the bounties to be paid for the additional term shall be as follows :—

(*a*) From the 23rd April, 1002, to the 30th June, 1903, both inclusive, the bounties shall be 90 per centum of the amount fixed by the said act.

(*b*) From the 1st of July, 1903, to the 30th June, 1904, both inclusive, the bounties shall be 75 per centum of the amount fixed by the said act.

(*c*) From the 1st of June, 1904, to the 30th of June, 1905, both inclusive, the bounties shall be 55 per centum of the amount fixed by the said act.

(*d*) From the 1st of July, 1905, to the 30th of June, 1906, both inclusive, the bounties shall be 35 per centum of the amount fixed by the said act.

(*e*) From the 1st of July, 1906, to the 30th of June, 1907, both inclusive, the bounties shall be 20 per centum of the amount fixed by the said act.

Provided, however, that if any steel ingots be made from puddled iron bars manufactured in Canada, no bounty shall be paid on such steel ingots.

The said bounties shall cease and determine on the 30th June, 1907.

He said : Mr. Speaker, the resolution before the House deals with the question of bounties on iron and steel. The object of the government in submitting this measure is two-fold. In the first place we desire to give a reasonable measure of encouragement to these industries. We have a strong hope, I think I shall be justified in saying a strong belief, that under the policy we have propounded in this resolution there will be a very considerable development of these important industries in the Dominion. In the second place, while adopting this policy and endeavoring to give some encouragement to the industries, we desire to keep in view the fact that the policy of bounties is one which may be well open to criticism, and that it is only to be regarded as a temporary movement, and, therefore, we should look forward to an early day when the industries established under the influence of the bounties may be able to stand unaided ; and so we provide for a gradual reduction of the bounties until they are extinguished. I suppose that on a question like this there may be found extremes of opinion. There may be those—I think there are some, perhaps many in Canada—whose views of political economy are so strong in one direction that they would not look with favor upon a bounty system to any industry at all ; and no doubt at the other extreme we shall find those who, believing strongly in the policy of protection, would be willing to have a system of bounties as a part of our permanent fiscal policy. Between these two extremes there is the happy medium which we think we have found in the policy which the government have pursued. That is to say, finding, when we came into power, a system of bounties in operation, we were prepared to continue that system for a limited time, with the desire that the industries which had grown up under that system should have a further opportunity of firmly establishing themselves ; and we think that when we extend the system by the present resolution, and fix a time at a comparatively early date when the bounties shall cease to exist, even those who may not generally approve of the system of bounties may recognize in that course a policy to which they could give their support. I think many will acknowledge that it would be justifiable to encourage industries by the granting of bounties, if we could look forward with a reasonable hope that at an early date they might be able to stand alone. It is in the belief that these industries may at the time referred to in this resolution reach that position, that we propose the policy now before the House. We think the policy of a gradual reduction of the bounties is a wise policy, even in relation to the industries which now exist. We have a number of iron establishments in Canada, and if we should abruptly terminate the bounties which, perhaps at the present time, form a large element in their receipts, the results to these various industries might be serious. We think it is in their own interest that we should adopt a system of gradual reduction until the bounties are extinguished ; and I trust that those now engaged in the iron industry will see that this is a wise policy. Perhaps it may not be out of place if I call attention to the history of these iron and steel bounties. It was in the year 1883 that the first bounty act was carried through Parliament. It was then in contemplation that the bounty system should last for six years. The bounty was fixed for two periods—the first three years at $1.50 a ton, and for the second three years at $1 a ton. At that time there were three iron furnaces in operation in Canada—one at Londonderry, N.S., one at Three Rivers, in the province of Quebec, and one at Woodstock, N.B. The Londonderry and Woodstock furnaces unhappily have not proved very prosperous. The Woodstock industry soon ceased operations, and the Londonderry works also have suspended. The Three Rivers furnace has been continued and has had a fair degree of success ; so that of the three that were in existance at that time, two have ceased to exist and only one remains. It was contemplated at that time that the bounty system would lead to the establishment of furnaces at Bellville and Ottawa ; but these projects never seem to have come to any substantial form.

In 1883 the bounty act was first passed. In 1886 another act was passed, whereby the bounty system was extended until 1892, which made a period of nine years from the passing of the original act. In 1890 another act was passed, by which the bounty was increased. Instead of being $1.50 for one term and $1 for another, it was provided that for five years after 1892, which would bring the term down to 1897, the bounty should be increased to $2 per ton. Up to this time the bounty had only extended to pig-iron, but in 1894 the resolutions were so worded as to include not only pig-iron but puddled iron bars and steel billets. In 1894 an act providing a bounty of $2 on pig-iron, puddled iron bars, and steel billets was granted to all existing furnaces for a period of five years from 1894, and, in the case of any new furnaces that might be started prior to March, 1897, the bounty was to be for a period of five years from the date at which such new furnaces were started. That brings us down to 1897. In 1897, in connection with the general revision of the tariff, it was deemed expedient to reduce the duties on iron considerably, and compensation was made to this industry, to some extent, by increasing the bounties on iron and steel, with the provision that the bounties should extend until 1902. The bounty provided by that Act was $3.00 per ton on pig-iron made from native ore, $2 per ton on pig-iron made from foreign ore, and $3 per ton on puddled iron bars made from the Canadian product and on steel ingots.

It is now sixteen years since the first bounty act was passed in 1883. If we carry ourselves forward to the date referred to in these resolutions proposed, we find that we shall have had a bounty system in Canada for not less than twenty-four years. After that measure of encouragement, we think it not too much that our iron and steel industries might be established on such a firm footing that they would then need no further government aid. Not only may we look forward to the reduction of bounties, but I venture to add that, in the interval, we shall be able to still further reduce the customs' duties on iron. We all agree that a supply of cheap iron and steel in the country is a very important element in the development of our various industries and the general progress of the country. Whatever method we may adopt to attain that end, whether by bounties or reducing the duties, it is of the utmost importance that cheap iron and steel should be furnished. I hope that before the time referred to in these resolutions has expired, we shall find the industry so firmly established that, not only will it not require a bounty, but we will be able to make further reductions on the duties on iron.

I have here a statement of the bounties paid from the beginning of the system until the present time. The first statement shows the bounty paid on pig-iron and the number of tons manufactured each year :

Statement showing bounty on pig-iron and number of tons manufactured for each fiscal year since the inception of the bounty.

Fiscal Year.	No. of Tons.	Bounty.
1883-84	29,388.16	$44,089 91
1884-85	25,769·13	38,654 91
1885-86	26,179·19	39,269 56
1886-87	39,717·00	59,576 16
1887-88	22,209·61	33,314 41
1888-89	24,822·42	37,233 62
1889-90	24,373·10	25,697 27
1890 91	20,153·01	20,153 05
1891-92	30,294·08	30,294 37
1892-93	48,420·18	93,896 48
1893 94	62,522·05	125,044 49
1894 95	31,691·19	63,383 96
1895-96	52,052·43	104,104 84
1896-97	33,254·36	66,508 69
1897-98	75,895·38	165,654 25
	546,741·29	$946,875 97

These figures relate entirely to pig-iron.

Then, I have a short statement of the bounty on steel billets and steel ingots :

Bounty on steel billets and steel ingots—		
1895-96	29,749·26	$59,498 52
1896 97	8,683·09	17,366 16
1897 98	23,049·43	67,454 03
	61,481·78	$144,318 71

I have, further, a statement showing the bounty on puddled iron bars :

Bounty on puddled iron bars—		
1895-96	2,805·58	$5,611 17
1896-97	1,509·42	3,018 82
1897-98	2,615·18	7,705 78
	6,950·18	$16,335 77

Summarizing all these, the bounties on pig-iron, steel billets and steel ingots, and puddled iron bars, the result is as follows :

SUMMARY.

	No. of Tons.	Bounty Paid.
Pig-iron	546,741·29	$946,875 97
Steel billets and ingots	61,481·78	144,318 71
Puddled iron bars	6,930·13	16,335 77
Total	615,153·25	$1,107,530 45

This represents the extent of the advantage granted under the various bounty acts from the inception of the system down to the present. Pig-iron is manufactured now in Canada by the Canada Iron Furnace Company, of Three Rivers ; John Mc Dougall & Co., of Drummondville ; the Hamilton Blast Furnace Co., and the Nova Scotia Steel Co., of Ferona, N.S. Steel ingots and steel billets are manufactured only by the Nova Scotia Steel Co., and puddled iron bars by the Ontario Rolling Mills Co. of Hamilton.

Under the new scale of bounties, which is a system of gradual reduction, beginning with the first year after the expiry of the existing act, we make the period from the 23rd July, 1902, down to the 30th June, 1903—a little more than a year—the object being to bring it down to the 1st July, which is a very convenient starting point. For that period we propose for the first year a bounty of 90 per cent. of the present bounty ; for the next year, 75 per cent. ; for the third year, 55 per cent. ; for the fourth year, 35 per cent. ; and for the fifth year, 20 per cent. Converting these percentages into actual figures, we find that the bounty on steel billets and steel ingots, on puddled iron bars and on pig-iron made from Canadian ore—these three have a bounty now of $3 per ton. But, under the new system, the bounty will be as follows :—

The first year of the new period	$2 75
Second year	2 25
Third year	1 65
Fourth year	1 05
Fifth year	0 60

After which the bounty shall cease and determine. In the case of pig-iron made from foreign ore, the bounty on which is now $2 per ton, the bounty will be as follows :

The first year of the new period	$1 80
Second year	1 50
Third year	1 10
Fourth year	0 70
Fifth year	0 40

After which the bounty will cease altogether. I observed in the public press a criticism of this policy, to the effect that we are striking a very serious blow at the iron industry, and particularly at that industry in Nova Scotia, in which province I

a n particularly interested. I am quite satisfied that experience will show that that criticism was mistaken. I firmly believe that instead of striking a blow at this industry, we shall, as a result of this policy, have a very considerable development. I believe that it is a fact that the Hamilton Blast Furnace Company contemplates considerable extensions At Deseronto, the Messrs. Rathbun, I believe, are turning out iron of a very good quality. At Midland a company are establishing new works. There is some talk—I confess I have no very tangible evidence—of proposed new works at Toronto and Own Sound. But whether these new works are established or not, those at Hamilton may be relied upon to continue and prosper, those that are already at work at Deseronto will go on and the works at Midland may, I believe, be regarded as a certainty. So that in the province of Ontario, there is a very fair prospect of a very considerable increase in the iron trade.

And, far from striking a fatal blow at the industry in Nova Scotia, I think we may fairly expect a large development in that quarter. The Nova Scotia Steel Company, carrying on its operations at Ferrona, in the county of Pictou, have had a fair measure of success of late, and I think I am correct in stating that they are contemplating the establishment of new works in the island of Cape Breton. But, whether they establish these new works or not, it is reasonably certain that other works will be established there by a gentleman who is already largely interested in the development of the mineral wealth of Nova Scotia. I refer to Mr. Henry M. Whitney, of Boston, who is the head of a great coal company that operates a large proportion of the coal mines of Cape Breton. Mr. Whitney's company was established under an arrangement made when I was premier of Nova Scotia. The wisdom of the arrangement made at that time was, like all important questions open to doubt in the minds of some gentlemen. It was strongly criticised in Nova Scotia, and even on the floor of this house the matter was deemed one worthy of very grave consideration. But, whatever doubts there may have been in the past, I think I am right in saying that times have vindicated that policy. The company then established is carrying on mining business in Cape Breton with great satisfaction to all concerned. It has cheapened the production of coal by means of improved methods both of mining and of transportation and by applying large capital which has put the business on a footing previously unknown. And now, as I have said, the gentleman who is at the head of this enterprise, has turned his attention to the iron industry. He has said that if certain bounties were granted for a certain period, he would be prepared to go into the industry on a considerable scale. The bounties we are granting are not those he asked, because he as well as others desired that the whole bounty should be continued for five years. But, while the bounties are not all that the gentleman desired, I believe they will be deemed by him sufficient for the purpose, and I anticipate that, at a very early day, we shall see a very important development of the iron industry there. Cape Breton possesses advantages of a very marked character for the iron and steel business. The great things required in this business are large bodies of ore, large bodies of coal, large bodies of limestone and large capital. It is only by having these in combination that you can make a successful iron industry. There is a very large deposit of iron in Cape Breton, but apart from that this gentleman has obtained an option upon and is now virtually in control of a very valuable iron property in the sister colony of Newfoundlond, the ore from which is found to blend very well with the native ore, while the Nova Scotia coal is admirably adapted for the work of smelting. Consequently, with the iron ore of Cape Breton available and the ore of Newfoundland so near that it can be brought to the coal at a very small cost, with large capital, and with limestone in profusion, all the elements required for the successful carrying on of an iron industry are combined in that locality, and I have no doubt that if that gentleman and his associates take hold of the matter, they will carry on the business on a large scale. Nor does it end there; for we all know that the establishment of a successful iron business, means the establishment of other businesses that grow out of it.

It may be only a vision, but I am willing to entertain the hope, even though it be a vision, that, as a result of the development of this iron and steel industry, we shall see a revival of ship-building in the maritime provinces, that we may see iron and steel ships built there. Nothing that has occurred in the maritime provinces for the last half century has done more to create difficulty, has been a most serious blow to the development of the resources of that section of the Dominion, than the decay of the industry of ship-building. It was a great industry throughout those provinces—not only the industry of building the ships, but the business of owning and manning the ships. Not only did our people build these ships, but as a result of the building of them, our young men all over our provinces grew up to be mariners and sailed over every sea; and, no doubt, to that very fact is due in considerable degree the large measure of intelligence that is usually credited to the people of Nova Scotia. They were people who went down to the sea in ships and did business on the great waters. But, unfortunately, it is part of the history of progress that there is no step taken onward but somebody is injured, however many may be benefitted. And, in the great march of the development of modern civilization, the industry of building wooden ships has suffered. As we had the change from wooden ships to iron and then to steel, we have now the change from steel sailing ships to steel steamers. You can now buy a steel sailing ship for what you could have bought a wooden sailing ship twenty-five or thirty years ago. Not having an iron industry the business of ship-building has passed away from us with the passing of the wooden ship. I think it was Mr. Henry Fry of Quebec, who was very enthusiastic in the advocacy of building iron ships. He has now passed away, but in his lifetime he expressed a strong opinion that the time was not far distant when Quebec would engage in the building of iron ships. With the development of the iron industry not only on the sea-coast, but in the west, I think we may reasonably hope to see the production of iron and steel plates for ship-building in Canada. With the improvements that are going on, the deepening of our canals, the opening of the Rainy River Railway, and other things that are being done to improve the transportation of the products of Canada, there will be a large development of the iron industry on the great lakes and also upon the coast; and, out of this I strongly hope we shall see a revival of that ship-building industry which was so important in Nova Scotia, New Brunswick and Prince Edward Island in by-gone years, the revival of which would have such great effect in promoting the prosperity of our country.

This has been happily described as Canada's growing time. Such, I believe, it will prove to be with regard to this industry. The success that has attended the efforts to develop the iron and steel industry in the past has not been inconsiderable. We have several industries established in the country which are now in a very good position. Nevertheless, hon. gentlemen opposite, who were chiefly instrumental in the inauguration of that policy, will, I think, admit that the results have fallen short of what they expected when they enunciated that policy. I believe that the time is more auspicious for the development of an iron and steel industry than for years past, and I hope that with the announcement of this policy—a policy of certainty, because we give certain encouragements for a few years to come—we shall see a large expansion of this important iron and steel industry and that through it much will be done for the advancement of the welfare of the people of Canada.

Goldfields of British Columbia.

PROPOSED AMALGAMATION OF WAVERLEY AND TANGIER COMPANIES—A COMMITTEE APPOINTED.

At the ordinary general meeting of the Goldfields of British Columbia, Limited, held recently, the Chairman said: I rise to move the adoption of the report, which has been circulated among you; but before doing so I should like to make one or two remarks concerning it. In the first place, I think an apology is due from the directors for the delay in holding this general meeting. That delay has solely been caused by the great difficulty we have had in getting anything like satisfactory, or indeed any, reports or accounts from the other side. I hope now things have been put on a better footing that in future that delay will not occur. I much regret that the report is not as favorable as you had a right to expect. I say "a right," because at our statutory meeting speeches were made prophesying a wonderful future for this company. It is always a somewhat dangerous thing to prophesy, unless one knows the future for certain; and in this case, as has often happened before, the realisation has not quite come up to anticipation. The report on the Channe group speaks for itself; but I am pleased to be able to inform you that Mr. Perry Leake, who is now our local manager, has great hopes that we may have a valuable possession in the claim known as the Poodle Dog. We have instructed him to continue the work, which he suggested should be done, and at the same time to practise rigid economy. With regard to the Thurlow town site, I am sorry to say that the manager appointed turned out to be worse than useless. Mr. Perry Leake has taken his place, and there is no doubt in his mind that this property should be made to pay its way well. The hotel has been let to advantage; he is proceeding with the sale of the land, and he has purchased a steam launch, with which to open up the trade of the country. I have no wish to take too gloomy a view of our future prospects, but profiting by experience, I think it well to follow that well-known saying: "Blessed are those that expect nothing, for they shall never be disappointed."

In the second paragraph of the report, we say that the financial success of the Goldfields largely rests upon developments in the Waverley and Tangier Mines. It is to these two children that the parent company looks for support, and I sincerely hope and trust we shall not look to them in vain. The general meetings of both these companies are to be held very shortly, so I will not take the words out of the mouths of the chairmen by going into a detailed account of the work done on those two properties, except to say that a good deal of work has been done, with, in a number of cases, satisfactory results. Nothing, of course, can be done without the sanction of the shareholders of the Waverley and Tangier Companies, but we have had under discussion a scheme of amalgamation of these two companies. The details of the scheme are not quite perfect yet, but as soon as they are completed, and if we get the consent of the shareholders of these two companies, the details will be laid before you, and we shall be glad to ask for any suggestions you may like to make. We are waiting the further discussion of the scheme until the return of Mr. Varden, of Messrs. Bainbridge, Seymour & Co., who is now out in that country, and will visit our mines on his way home. We consider that one of the great advantages of the proposed amalgamation would be that both properties could be worked together more economically than at present, and that the concentrator, which is now at Albert Canyon, could be erected for the mutual benefit of both companies. But, as I said just now, till we get the consent of the shareholders this scheme can only be a suggestion. If this scheme is carried through we shall still have in our possession six more claims in the Albert Canyon and Downie Creek group, on which no work has yet been done. With regard to the advisory board out in British Columbia, we did not think it necessary to incur a continuation of that expense, so that we informed the gentlemen forming that board of the fact, with the result that they voluntarily sent in their resignations. After some further remarks the chairman concluded by moving the adoption of the report and account.

Colonel T. H. Anstey seconded the resolution.

Mr. Cope asked for some information as to the Montague, the Oldham and several other claims.

The Chairman replied that it was one of the propositions of the amalgamation scheme that the Montague should be given to the Waverley for a consideration, and that the Oldham should lapse into the Tangier. The options had been dropped. They had, of course, shares in the different companies.

Mr. Cope said that in looking at the balance sheet for the year, he did not think the directors had done much for the shareholders. They had not seen that the accounts had been properly kept, and the report admitted the vouchers for expenditure had not been received. He did not wish to make trouble, but he and his friends held about 5,000 shares, and they wished to have some safeguard that such things should not occur in the future.

The Chairman: We have had great difficulty in getting reports from the other side.

Mr. Cope continued that he wished for the future the company should not be mismanaged as it had been in the past. British Columbia was not such a long way off, and it would not have been a great hardship for one of the directors to have gone there.

The Chairman explained that Colonel Anstey was out there for two months.

Mr. McIntyre thought there was many things about the balance sheet which required explanation. He did not know where to begin or to end, but the result was exceedingly disappointing, and very different to what everyone connected with the company was led to believe. In the first place, he would like to know what the company received from the Waverley Company for the property, and in what form. In the same way, what had they got from the Tangier Company, which was brought out some time ago? It seemed to him that nothing short of a committee of shareholders could satisfy the requirements of the meeting. He thought that the present directors would be the better for being assisted by some independent shareholders. He would therefore propose that a committee should be appointed, to confer with the board, to get all the necessary information with regard to the balance sheet, and to report to a future meeting of the shareholders. (Hear, hear.)

Mr. Vann seconded the amendment, and stigmatised the balance sheet as a scandalous one. He would like to know what the item of £29,311 expenses of issue represented?

Mr. A. Matheson (director) explained that the money was paid to persons who subscribed for shares of the company—to underwriters and others. The total number of the shares was about 220,000.

Colonel Anstey stated that it became necessary to audit the accounts in British Columbia. Messrs. Wilson and Sinclair therefore sent an auditor to do the work, hence the board were enabled to issue this somewhat imperfect balance sheet. The directors had been handicapped most painfully by people out there, who ought never to have been appointed.

Mr. Grant-Govan (late managing director) said that Mr. Sherlock was appointed the manager of the town site, as the only man who knew the ins and outs of it; while the accountant was recommended by a London auditor. If the board then had not got good accounts from those two gentlemen, they ought to. The company was temporarily on the rocks, but when they got rid of the 200,000 or 300,000 vendors' shares, which had been paid for nothing, it could be floated again. He would advise a policy of conciliation, and they would then make a success of this and the subsidiary companies.

The Chairman said that the board invited a committee to confer with them. They had absolutely nothing to hide, but had done their best all the way through. The directors had worked hard and had taken no fees for some time.

Mr. Grant-Govan added that when he managed the company he intended to hold the meeting last August, when he would have shown a balance sheet with a profit of £100,000 on the market price of the shares. Speaking from memory, he supposed he had 9,000 vendors' shares. He was quite willing to give up these, and only to retain those he had actually paid for.

The Chairman then put the amendment for the appointment of a committee, which was agreed to.

On motion of Mr. John Grant, the Earl of Essex and Colonel Austey were re-elected directors.

Mr. Grant-Govan remarked that the mover of the last resolution was the holder of 110,000 vendors' shares, and as long as he retained that large holding there would be no solution to the company's difficulties.

Mr. John Grant retorted that if he had that number of shares he had given value for them, while Mr. Grant-Govan had not given much for his. He would be prepared to do everything in his power to assist the company.

The auditors (Messrs. Monkhouse, Stoneham & Co.) were then re elected.

Messrs. Cope, Rawlings, and McIntyre were appointed the members of the committee of consultation, and the meeting stood adjourned to a date to be fixed by the committee.

British America Corporation.

Mr. Carlyle (the company's manager), writing under date of Rossland, B.C., May 31, reports as follows:—"Please accept my report for the months of April and May in reference to the work being done on the properties of the (*a*) Columbia Kootenay Mining Company, Limited; (*b*) East Le Roi Mining Company, Limited; and (*c*) West Le Roi Mining Company, Limited. I regret that, as I was absent at the end of last month arranging for new machinery, and at the same time recuperating from enforced confinement through my accident, and also as I had not been able to see these properties for some time, I felt unable to send you the usual report. Recently, however, I have become once more able to go under-ground, and am prepared for report. It will be noticed that during the year we have done 16,500 feet of work, and from the results attained I know that very little of this has proved useless, or to have been done in the wrong place.

Mine.	Cross-cuts and Drifts, No. of ft.	Raises and Winzes. No. of ft.	Shafts. No. of ft.
Columbia Kootenay	5,066	520	....
Great Western	1,039	...	231
Nickel Plate	4,163	140	....
Josie	2,696	226	....
Number One	2,000	53	320
Grand total	16,454 feet of work.		

Columbia Kootenay Mining Company, Limited.—During the past two months 1,080 ft. of new work has been done. We are now exploring the vein in all the tunnels, or Nos. 3, 4, 5 and 6, and of late we have disclosed a large amount of ore. Tunnel No. 3—The raise was run up to a height of 80 ft., exposing, as stated in report for March, considerable good ore. From cross-cuts Nos. 1 and 2 drifts were run along the hanging-wall, exposing some good ore, but further cross-cutting will be done here, as the vein is wide and a better chute may be found towards the centre, as was the case in cross-cut No. 2. Tunnel No. 5—The total length of this tunnel is 1,062 ft. Near the face of this tunnel a cross-cut is being driven both ways, showing a ledge about 50 ft. wide of very low-grade material. As we are now about under where the good ore was found in No. 4 tunnel, we are hoping to find the continuation downward of that chute. The raise to No. 4 is now up 130 ft., still in low-grade pyrrhotite.

"East Le Roi Mining Company, Limited.—Great Western Mine—Boilers and a large pump will soon be installed, and with this better equipment we will continue sinking to the 400 ft. level. Nickel Plate Mine—Work has been concentrated upon the new shaft, which, with two machines, is now up to 100 ft. above the 200 ft. level. On the surface above the shaft has been started; but in the meantime a new gallows frame is being erected, and a strong steam hoist, once in use at the Le Roi Mine, will be ready for work in ten days time, when sinking will be begun, and very quickly the shaft will be completed so that sinking can be begun below the 200 ft. level. My intention is to cut out a station at the 300 ft. level, but to explore thoroughly on the 400 ft. Our machine has been kept at work to the east on the south vein, which a cross-cut showed had been thrown 40 ft. to the south. For 100 ft. this drift has followed along a strong vein that shows above on the surface, but so far the values have been low. However, as the ledge is looking very strong in the face, we are continuing to the east, and we believe this is the Great Western vein.

"West Le Roi Mining Company, Limited.—To the west, or in the Annie ground, the cross-cutting has been suspended to be shortly resumed, especially to the north so as to get below a vein showing on the surface. In the shaft a station has been cut out on the 300, or main level, and sinking is now well in progress. On the surface we are preparing for the new gallows frame and electric hoist, and it will not take us long to reach the 400 ft. and 500 ft. levels. No. 1—The vertical shaft is now down 360 ft., and at the 300 ft. mark a station has been cut and a cross-cut run, which just entered the vein, showing the hanging wall streak 12 in. to 16 in. wide, of fine copper ore, assaying 18 dwt. in gold. Then follows 10 ft. of low-grade material, and at the time of writing the face of the cross-cut was showing more ore coming in. On the 200 ft. level, after picking up the vein, thrown to the south 34 ft. by faulting, we have continued west 200 ft. along a strong vein, and two cross-cuts have shown the ledge to be 14 ft. to 16 ft. wide. For the last 50 ft. the ore, hitherto low-grade, has been assaying higher daily average samples from all of the face assaying from $8 to $18 per ton. At the present time the face looks very well, and the ore averages $10 to $12. As we have considerable water, a compound duplex steam pump, capable of pumping 300 gallons 500 ft. per minute, will shortly be installed when the 400 ft. level is reached, and I believe we will then be able to handle all water easily and very economically. To the east this drift has disclosed nothing in the cross-cuts, although they will be continued farther to prove conclusively once and for all, whether the vein continues this way in this property, or by faulting is the splendid vein being mined in the War Eagle property.

London and B. C. Goldfields

The first ordinary general (statutory) meeting of the London and British Columbia Goldfields, Limited, was held last month.

The Chairman said: As you are aware, this is the statutory meeting of the company, and is rendered necessary because at the beginning of this year we decided to convert our deferred shares into ordinary shares, and, therefore, had to register a new company. As a rule, a chairman is unable to give much information at a statutory meeting, but as this is practically a continuation of our old company I am able to give you a little up-to-date information. You have already been informed by circular that the managing director (Mr. Popkiss) sailed last month for British Columbia, and I believe he arrived there on Saturday last. Naturally, we have not had time to get written reports from him, but we have had two cablegrams, and he is able to give us some information, not from his own personal observation, because he has not been able yet to see the mines, but from particulars he was able to acquire from Mr. Fowler, our engineer, and from Mr. Robertson, our manager. I am sorry to say that there is a strike going on in British Columbia. The Legislature passed a bill making it illegal for any man to work underground more than eight hours a day. So far as I have been able to gather from correspondence in the press and otherwise, this was not a piece of legislation sought for by the miners, but a piece of grandmotherly legislation which was resisted both by the employers and the employés. However, miners who had been getting $3.50 a day were . .t willing, even though they were going to work eight hours instead of ten hours, to accept $3; on the other hand, the employers were not going to pay the same rate for eight hours work as they had been paying for ten. The inevitable result was the formation of a Miners' Union and a considerable and far-reaching strike. The effect of this strike has been that for the last few weeks practically no mining has been going on on our properties, or, so far as I know, on any other properties. Mr. Popkiss has expressed the opinion that before very long the strike will collapse, and so far as I can gather we shall not have to pay more than a pro rata proportion of the $3.50 for the eight hours. The strike has delayed our work to some extent, but it is one of the fights that must take place, and we were bound to join with the other masters in resisting it. I will now deal with the Whitewater Mine. Those of you who received the reports on that mine will, I think, in common with the board, have been considerably disappointed. The machinery has crushed, as was expected, something over 3,000 tons a month, but the value of the concentrates resulting from the crushing of this large quantity of ore has been decidedly below our estimate. The principal reason for this is that the concentrating plant which was put down is not so perfect as it might be. In saying that I do not for a moment pass any censure, directly or indirectly, on our engineers. Anyone who is acquainted with practical mining knows that every ore varies in its characteristics, and it is only by actual experiment that one can tell which is the best process. Although our returns have been poor, because I believe we have had a very low extraction, that does not mean ultimate loss, because I have reason to believe that they store up what I may call the tailings, and later on they will be treated. Meanwhile, additions have been made to the plant, and we are informed in a cablegram from Mr. Popkiss that better results may be expected in the future. Speaking for myself, I have not lost confidence in the Whitewater Mine. The rich shipping ore which the old owners used to ship is now giving place, under our policy, to a concentrated ore, because we do not pick the ore, but take everything just as it comes, and put it through the concentrators. The next property I will refer to is the Ymir. Mr. Popkiss in his cablegram expresses a very strong opinion about this property, or, rather, he says that Mr. Fowler still has absolute confidence in its future. There is a cablegram this morning which will be published in due course, showing that during last month they crushed over 2,000 tons, and the result of this—plus a certain amount of picked ore—will, I think, be the realisation of something like £5,000 gross. (Hear, hear.) When the first returns were made in the Ymir, I understand some shareholders thought it was a very low-grade ore; but I think that was explained in the circular. The vein is a very great width, varying from 11 ft. up to 30 ft., and in some places the ore is very rich, while in others it is of a lower grade. The lower grade ore is free-milling, and we get a fine extraction from it. The higher-grade ore it would be madness to put through an ordinary mill, and therefore it is collected, put into bags, and shipped to the smelters. The early returns contained none of that rich ore; but during the last month some 4 tons to 6 tons were included, and form part of the £5,000.

In connection with the Ymir, I may tell you that we have received an unofficial intimation that the West Australian Goldfields will, at the end of this month, exercise their option. As things have gone, it has turned out a very good option for them e but it has also turned out extremely good business for us; for not only shall we have received by the sale of shares something like £55,000, but we shall have been able to give you 10,000 shares, and still hold over 70,000 shares. What the first cost of that property was I need not tell you now; but I may say that the profit from that transaction, taking to-day's price of the shares, must very nearly represent £140,000, which is our nominal capital. (Hear, hear.) In addition to that, as I think I pointed out at the last meeting, we have the Ymir Extension, and I, personally, am very hopeful that that some day will turn out to be as good as the Ymir itself. We have done absolutely no work on that property, and this is merely a hope rather than an expression of opinion. With regard to the Ruth mine, I am not in a position to give you any information today. Mr. Forster has gone out there, and Mr. Fowler has recently visited the property, and we are daily expecting a report. They are erecting a concentrating plant there, which, I think, will commence work about the middle or end of August. I now come to a property of which you have heard something through the circular, viz., the Enterprise Mine, in which the London and British Columbia Goldfields Company hold about 43 per cent. interest. From the report of Mr. Fowler and Mr. Kendal, and from other information which we have received, we believe that that was an extremely fortunate purchase, and our interest of 43 per cent. ought to represent ultimately a very large profit indeed. It is a fully developed property, and we have shipped since we got possession 577 tons of ore, which realized $38,500. There are 125 tons still to ship. That mine, in common with the Ymir and Whitewater, has been closed owing to the strike. Immediately it is over we shall commence operations, and develop the property as rapidly as possible, and also proceed to erect a concentrator. I ought to say in this connection that the strike has affected us in

two ways—in the first place, by stopping development, and in the second place, by stopping the issue of the company. A company was formed with a capital of £150,000, directors were appointed, the underwriting was arranged, and everything was ready to launch the company. The result would have been a large profit to us, as well as to those who are associated with us; but in view of this strike, which was then pending, we deemed it wise not to make that issue. I think, myself, we acted with discretion, and I hope you will also be of that opinion. Speaking generally of British Columbia, although the strike has delayed us, it has had one good effect, inasmuch as it has made the owners of properties more or less developed a little less exorbitant in their demands; in other words, we are able to buy properties to greater advantage today than we should have been if things had gone on smoothly and there had been no strike. With regard to our other interests I am unable to give you any information; but so soon as Mr. Popkiss returns we shall either send you a report by himself or, what is perhaps more likely, about the end of August or some time in September we shall probably call a meeting of the shareholders, so that you can hear from him for yourselves what he has to say. Last night a letter was received from Dawson City, addressed to the directors of the Yukon Goldfields. We have a very large interest in that company, and we are also the parents of it; therefore I think I should not be doing wrong if I tell you that that letter is extremely satisfactory. Our old bonanza claim, which was expected to do so well this year, is going to do even better than was expected, and the new claims which Mr. Wood took up on his arrival in April are developing far more satisfactorily than we could possibly have expected. As the result of a few days working there one of our men who is working half shares with us got no less than $68 (or about £13) per day over an average of twenty days. It a man can go and wash out £13 for himself and the same for us it is a very bright prospect indeed, and as we hold 90 per cent. of the founders' shares in the Yukon Goldfields, as well as some hundreds of the ordinary shares, I think we may confidently look for a very fine return from our investment. (Hear, hear.) I think I may anticipate a question which may be asked as to the payment of an interim dividend. Both in our capacity as directors and shareholders that question will certainly receive due consideration at the hands of the directors, and I do not think it will be very long before we shall give you an interim dividend. (Hear, hear.) But I think you will agree that it will be wise to wait and hear what Mr. Popkiss has to say. Perhaps he may come back and say that the strike has given such opportunities for purchasing other properties that he would strongly recommend us not to pay an interim dividend, but to wait a little and use our money to greater advantage. On the other hand, we are receiving a large sum from the West Australian Goldfields for exercising their option, and therefore it would, perhaps, not be unreasonable for the shareholders to expect to get part of it. That question we shall leave until Mr. Popkiss returns.

A vote of thanks to the chairman concluded the proceedings.

Asbestos and Asbestic Company.

DISAPPOINTMENT IN THE QUANTITY OF ASBESTIC OUTTURN, BUT CONFIDENCE IN FUTURE WORKING.

The second annual general meeting of the Asbestos and Asbestic Company, Limited, was held this month in London.

The Chairman, after referring to the details of the accounts and comparing the figures with those of last year, said he explained to the previous meeting that after the first six months of the company's existence it seemed to the directors that the divided-earning time must be more prolonged than they had anticipated, and they therefore decided not to put aside any further fees until a dividend-earning position was attained. The fees were charged but had not been drawn, and there was no intention to draw them until the company was in a position to pay dividends. The balance brought forward from last year was £2,180, and that amount had been reduced by the loss during the past year of £198, leaving the balance now to the credit of profit and loss of £1,982. Last year they did not publish a profit and loss account, but distributed a copy of it amongst the shareholders at the meeting; he had, however, the figures of both last year and this year before him. The total expenditure in Canada was £10,412. The board had been able to make some economies since then. The repairs to plant were a good deal heavier than last year, which had arisen from two unfortunate accidents, necessitating a good deal of expenditure, but he was glad to say that steps had since been taken which it was believed would prevent any re-occurrence of anything of the kind. Altogether, the expenditure in Canada had been £10,412, against £9,700 in the previous year. The gross profit on trading during the year had been £13,368, which, he was sorry to say, was a good deal smaller than the gross profit earned in the first year, which was £18,969. The result was very disappointing to the directors. When he addressed them last year he told the shareholders that the directors had been grievously disappointed that they had not been able to turn out anything like the quantity of stuff required to fulfil their contracts; and that they had found another most serious difficulty in that while they could produce asbestic in very large quantities, they could not find a market for it. Their position during the year they were now discussing had improved a little, because the demand was undoubtedly better, but it had not improved much, and the board were still very much disappointed although, he hoped, not altogether discouraged. They depended very largely, as shareholders would know, on the sale of asbestic, and he remembered telling them last year that, in his own opinion, they would never be able to produce any very large quantities of long fibre. They had produced in the year under review a larger quantity of long fibres than previously, but the quantity was still woefully deficient of that which they require to fill their contract. Leaving asbestic out for the moment, he told them last year that the quantity of long and short fibres produced in the period ended March 31, 1898, was 4,470 tons. The contract called during the same period for no less a quantity that 8,400 tons, so that it would be seen that they were not more than half way towards their contract quantity. In the year ended March 31, 1899, they increased the outturn and delivery of those fibres to 6,045 tons, which was an appreciable improvement. Coming to the asbestic results, in the first year their sales of rough and finished asbestic were 6,960 tons, but in the year just ended they were only 7,005 tons. This falling off was to be explained in a large measure by the fact that in the first period they had sold and charged to the American Asbestic Company a good deal of asbestic which that company had been consuming during the second year, and they hoped therefore —and he thought they were justified in hoping—that in the year they had now entered their sales of asbestic would be a good deal larger.

He spoke to them last year about the great difficulty they had in introducing asbestic—how hard they found it to induce architects to specify it. That difficulty had continued in a very large degree. Only last week they had had a letter from a well known London architect—a close friend of several members of the board—reminding them that two years ago he promised to use asbestic as soon as he possibly could, but stating that the opportunity had only now occurred. That gentleman was good enough to specify asbestic to be used in connection with one of the best known London public buildings, and the board had so much confidence in its success that they fully believed its use in that case would lead to its specification by architects in many other directions. The Carlton Hotel, Haymarket, had been plastered with asbestic, and he hoped some of the shareholders had seen and appreciated the work that had been done there. The board would feel entirely discouraged if, notwithstanding all their efforts to make sales of asbestic, they had any reason to think that the material itself was in any sense wrong; but he was able to say, and, as he had said before in the most emphatic terms, that they had never known asbestic as a wall plaster to be any other than a big success. (Hear, hear.) They had only to be patient, and to persevere in pushing it in every possible direction, and inasmuch as every time it was used it was appreciated and recommended, he felt sure they would in time reach that large scale which was necessary in order to put the company in the position they hoped to see it attain. (Hear, hear.) By the report it would be seen that their managing director, Mr. F. Boas resigned his position on May 4 last. Unfortunately Mr. Boas had suffered a good deal from bad health during their last financial year, and as his services were very expensive, his remuneration being fixed at £2,000 a year, it was felt they could dispense with them. The board were not thinking at present of appointing a fresh managing director. Mr. Pearson, who was their manager and accountant in Danville, was a young man in whom they had the fullest confidence. He had done admirable work all the while he had been there, and the board were confident that the management of the company could not be in better hands. Naturally he was a much less expensive man, but he was very efficient. Then Mr. Allan, of Montreal, who was an original director, resigned on August 24 last. He wrote that he did not feel that he could be useful to the company, and therefore tendered his resignation, which they accepted. His place on the board had not been filled. Having invited questions and criticism, the Chairman formally proposed that the report and accounts be received and adopted.

Mr. Henry Hayman seconded the motion.

Mr. John Wilson, of Edinburgh, pointed out that the prospectus set forth that on the company's property there was an unlimited supply of both asbestos and asbestic and a market created and waiting for it, and the figures given showed that upon one contract alone they might expect to make sufficient profit to pay a ten per cent. dividend. He wished, therefore, to ask how it came about that in the second year of the company's existence a balance sheet was presented which actually showed a loss. The question must be raised whether they had the property which was specified in the prospectus. (Hear, hear.) He thought the directors ought to approach the vendors with a view to their making restitution of a large portion of the purchase price. (Hear, hear.) He would propose that the report be not adopted, and that the vendors be so approached.

Colonel Hargreaves seconded Mr. Wilson's proposition.

After some further discussion, the Chairman said he would be very sorry if the shareholders decided not to receive and adopt the report and accounts, because they were true and faithful in every particular. At the same time they heartily agreed with what Mr. Wilson had said, and nothing would please them more than to get something from the vendors. He suggested that the report be adopted, and the directors would accept an instruction from the meeting to make, and press to the utmost, a claim upon the vendors for restitution of some portion of the purchase money, and they would promise to report to the shareholders the result of such claim. (Hear, hear.)

Mr. Wilson withdrew his amendment in view of the undertaking given by the Chairman, and the reports and accounts were unanimously adopted. A further resolution was then passed instructing the board to press a claim upon the vendors.

The retiring directors (the Chairman and Mr. Hayman) and auditors (Messrs. Turquand & Co.) were re-elected.

A vote of thanks was accorded the Chairman, and the proceedings terminated.

LAKE OF THE WOODS.

This season is no doubt the busiest as regards mining that this district has yet seen. There is scarcely a miner to be hired in Rat Portage. As many as twenty-three left in one day recently, to work at different points around the lake.

At many of the prospects where steam power has not yet been established, the frequent and heavy showers, with the attendant warm and humid atmosphere, have entailed considerable loss of time and inconvenience, through the constantly accumulating water in the shafts, and the difficulty of aerating the shafts after a blast and purifying the air to an extent that will admit of the miners working in it. In one shaft, indeed—over 75 feet deep, however—work was completely stopped; a hand blower having been procured however, an attempt will be made to resume sinking. This is something that mining men do not take sufficiently into account, viz., the trouble that arises from foul air in shafts in the summer time; I mean the foul air generated in the explosion of dpnamite, prohibiting in many cases the working of more than the day shift, injuriously affecting the health of the miners, impairing each man's efficiency, and tending to make them generally discontented.

Most of our prospectors took a turn in the woods early in the season, some starting out before the ice broke up, but nearly all are taking a rest now, during fly time and the rainy season. Two or three good finds are reported, one being between Witch Bay and the Stella Mine, made by Mr. Israel Gagnion, one of our most successful prospectors. The property is said to be bonded already at a good figure.

REGINA.

The cyanide plant is now resting in company with the silent Tremaines, all the pulp having been run through. Sinking is progressing in the main shaft.

THE BURLEY

has been unwatered, and it looks as if active work would soon be resumed.

CAMP BAY.

The most notable event here of late has been the sale of the Trojan mine owned by Thos. Walsh, Chas. Sterling and Marty Wright to a Chicago and Montreal Syndicate for $30,000.00 and a one-fifth interest. There are two shafts on the property of 60 and 40 ft. respectively, and the first work by the new management will be to put both down to the 100 ft. mark. Captain Marty Wright will be in charge; he left for the mine with his crew on the 10th instant.

The shaft which Captain Proudlock is sinking for the Sentinel Consolidated Mining Co., Limited, on the property adjoining the Bully Boy, under an option from the Coronado Co., is down 76 ft. Work was suspended for a few days on account of "bad air," and the party disbanded, but the captain is engaging a fresh gang as fast as he can get them, and will shortly proceed to work again. He was so unfortunate as to have five boxes of dynamite and thirteen sacks of blacksmith's coal stolen from the shaft premises. There appears to be no clue as to who were the thieves, and there is but a slight chance of the lost property being recovered. Depredations of this kind are of very rare occurrence throughout this mining region.

Deer Lake.

Mr. S. H. Brockunier, manager for the Virginia Mining Co., has recently returned from a visit home to Virginia. No mining has been done for some time; but I believe a compressor plant is to be put in at once, when sinking will be resumed.

Two parties of Western American mining men have been out within the last six weeks to see the Pritchard-Moore-Scovil locations a few miles northeast of the Virginia Co's camp. This is undoubtedly a very good property, but wholly undeveloped, and therefore there is difficulty in making a deal. Captain Pritchard is however proceeding to the property in a day or two to do some sinking on one of the veins. Quite a number of mining locations were surveyed in the Deer Lake country this summer.

Witch Bay.

The Chemical Mining Co. are down 25 ft. or more with their vertical shaft, which is located some distance east of the old Gordon-James shaft, upon higher ground. At the proper depth crosscuts will be run to intercept the veins.

At the Beck mine, "cornering" the Triggs, the principal shaft is now down 60 ft. and the valuable character of the property is being demonstrated. Captain McKenzie is still in charge. The owner, Peter Thornton, Esq., sailed for Glasgow early in July.

Gold Hill.

The Upton syndicate which has the option upon these properties, is carrying on some prospecting work; they have resumed sinking in the old Black Jack shaft.

Hay Island.

The unwatering of the shaft is about accomplished, and it is supposed that mining will soon be started.

Manitoba Boundary.

The Manitoba Boundary Mining Co. of Gladstone, Man., have a party of seven men at work on their property on Falcon Lake trail, and the shaft is down 46 ft. They appear to have a wide vein or belt of quartz and schist, carrying gold. Captain Geo. Gregg is in charge, and he says the gangue shows a growing tendency towards unmixed quartz as they go down. There are some very strong leads in that section, and if they should prove even moderately low-grade in gold they will, with development, make paying mines

Shoal Lake.

The Rat Portage Miner of 13th inst. publishes an interview with Manager Breidenbach of the Toronto and Western Mining Co., Limited, from which the following notes are extracted. It appears that the portion of the property situated on Bag Bay, known as the Sirdar group, and comprising an area of 1,002 acres, is being transferred to a subsidiary company to be known as the Sirdar Gold Mining Company, with a capitalization of one million dollars. In addition to the work now being done on the main or Sirdar vein, which has a shaft 200 ft. deep; the Bullion vein has a shaft 20 ft. deep, the Contact 20, the Fork 57, the Central 16, the Cascade 20. All these veins are on the Sirdar location proper.

On the Sirdar Peninsula or Point property, on the Camp vein there is a shaft 35 ft. deep; besides, on the same vein, a diamond drill boring has been made 260 ft. deep, cutting the vein with good results. The Mikado vein has three shafts, each 10 ft. deep; the Summit 44, the President 30, the President branch 15, the Cliff 15. The Helmet has two shafts, one 22 ft., the other 39 ft. deep. Every one of these openings shows good values.

There are two separate camps on the company's property which are run independently of each other, one on the Sirdar property and the other on the Sirdar Point property. On the latter is situated the large new residence being built for the manager and also new quarters for the men, and the office.

J. M.

Rat Portage, July 18th, 1899.

Dominion Coal Company.

The output of Reserve Colliery on the 26th June was 2,847 tons. The average output per day for that week being 2,560 tons. This is the largest amount of coal brought to the surface from any of the company's mines, and compares favorably with the output of the larger American collieries.

Messrs. McCallum and Scott, Chemists of the Dominion Coal Co., have moved to the new laboratory which has recently been erected at Glace Bay. Although special attention has been paid in the equipment to coal and iron analysis, it is thoroughly fitted out for general commercial work. The gas used for heating purposes is obtained from a gasoline gas generator placed at the rear of the building. The laboratory proper is in the centre of the building, with a library and balance room on one side and sampling room on the other.

The men resumed work in Caledonia Pit on July 3rd, and although the output is steadily increasing it has not yet reached its usual average.

The Company has just received a new steam shovel, which is to work at the new banking station near the Hub mine. This makes two of these shovels which are in use for loading coal at this place.

There is being installed at Dominion No. 1 a direct current dynamo of the multipolar type. It is a 30 Kilowatt 240 ampere machine, direct connected to a high speed engine. This will light the surface plant, pit bottom and main haulage ways.

REVELSTOKE.

The city of Revelstoke is situated on the Columbia river, at the point where the main line of the C. P. R. crosses it for the second time on its way westward; and from the fact that easy communication is to be had all the year round both with the East and West by rail, and with the South and North by rail, water and pack train, it is obvious that the position of the town site is almost an ideal one. The city is well supplied with water, electric light, and also with bicycles, but it is not so much due to these advantages, great as they are, that the citizens pin their faith to their town, as to the surrounding mining districts of the Lardeau on the South, the Big Bend on the North, and the Illecillewaet on the East. Probably the oldest of these is the Big Bend, where extensive placer diggings were carried on in the "early 60's" as the remains of considerably large camps will testify, and where gold seeking has been prosecuted more or less intermittently ever since. This Big Bend district is reached from Revelstoke so far only by trail during the greater part of the year, but at certain stages of the river boats can be taken up, though with some difficulty and no little danger as the name of Death rapids, some 50 miles from Revelstoke, will sufficiently indicate. The placer diggings were situated near Goldstream principally, on French and other creeks that flow into that river some seventy miles from the town; and very good returns are said to have been made in the early days. Since then, as may be expected, very much more development has been done, and at present it seems as if copper might replace the gold to a very great extent, though immense bodies of auriferous arsenical pyrites are also known and are being worked by various joint stock companies, who have their headquarters at Revelstoke and elsewhere. Some especially fine specimens of copper ore (and native copper) have recently been discovered in the Standard Basin, some 40 miles up the Columbia from here, and some six or eight miles inland east of the river. This property it is now proposed to bond to some capitalists from Boston, and while the prospectus issued certainly literally bristled with statements that will not bear investigation, yet there is no doubt whatever that it is an exceedingly fine surface showing and well deserving of further exploration. Owing to the extreme lateness of the season, which means the amount of snow still on the ground, not so much development has been done as was hoped for last fall, but every effort is being made to put the property into a presentable shape for the expert to examine.

Other finds, similar in character, are reported from the same neighborhood, and if these turn out as well as is expected, there will probably be a smelter erected to treat the ore at some convenient point between the mines and the town. The old smelter, which formerly existed at Revelstoke, has been dismantled and the machinery sold long since; and the voracious Columbia river has successfully disposed of the building. This smelter was a monument to the supreme incapacity of its managing directors to manage a smelter, and a very good illustration of the way some English companies attempt to run a metallurgical plant out in far distant B. C.

All the placer gold in the Big Bend district is not yet exhausted, however, as an old timer came down from there the other day with a very fine showing of "dust" from Smith creek, including one nugget valued at $7, and he, together with his partners, express a very firm faith in the value of their claims.

Much nearer town, in fact not more than 25 to 30 miles away, very rich pyrites has been found, and work is being actively prosecuted on the various properties—at Carnes creek by the Carnes Creek Gold Co., and at Laforme Creek on the Adair group. This ore is almost entirely arsenical pyrites, carrying a considerable amount of gold, and not infrequently a little copper also, and on the authority of Pellew Harvey, of Vancouver, it is said to be capable of economical treatment by the cyanide process, especially after a preliminary milling to catch any free gold. Some of these leads are over 50 feet wide between the walls, but of course all is not solid ore in that distance, though much of it is

From Illecillewaet, which district must include Albert canyon, comes very cheering news. Some very fine galena was brought here quite recently for assay, which was worth, at the present value of metals, some $120 per ton in silver and lead. As the claim is very conveniently situated, and accessible, it should yield a handsome profit to its lucky owners; but full details of the width of the ledge, etc., are not to hand at the time of writing.

The Tangier mine (connected with the Waverly) is reported on reliable authority to be looking well, and the management is advertising for miners at $3.50 a day. It seems quite possible that with the exercise of common sense, care, and especially economy, these properties may yet become as valuable as they were originally thought to be, instead of being as at present the "awful example" of extravagant English management.

The Lardeau, including of course the Trout Lake district, must now command our attention, as the prosperity of Revelstoke is largely dependent on the success of the various mining enterprises there. The principal town at present in the Lardeau is Trout Lake City, which is beautifully situated on the north end of the lake, but another town, Ferguson, may run it close in the near future, as it is the intention of the Great Northern Railway to make Ferguson one of its principal stations. When it is considered that the C. P. R. are also actually building a line into that district, it will easily be seen that the prospective value of mining property there will be very much increased. Perhaps the best known and most developed of those properties is that known as the Silver Cup Group, which has well passed the prospect stage and can honestly be termed a mine. The ore from this mine is very rich in silver, many assays running as high as 1,000 ozs. per ton. The prevailing mineral in the district seems to be galena with grey copper, and the average assays through the whole camp are extraordinarily high in silver, and very frequently carry gold as well. It will be quite impossible in the limits of these notes to name even, every group of known and more or less developed claims, some of which of course are of considerably lower grade than those just mentioned, but the lower grade is made up for by the immense quantity in sight, and the establishment of a smelter in the vicinity can be only a matter of time. But it is necessary to mention the Nettie L, near Ferguson, which recently made a shipment to Trail Smelter that ran some $450 per ton; also the Beatrice, which is now prepared to ship ore in considerable quantity, expected to average at least $125 per ton, and the St. Elmo, which has made a small shipment that was valued at $120 per ton. All this which does not represent a tithe of the known and proved properties in the district, goes to show that it will be a very hard matter to find any other locality in Kootenay that for its age can produce a better record; and with the advent of either one or both of the railways now under construction, giving ready access north or south, the Lardeau will stands as it deserves, well in the front rank.

A. H. H.

BOUNDARY CREEK.

COPPER CAMP.

King Solomon and Copper Queen.—Work has been suspended on these properties owing, it is said, to the enforcement of the eight-hour law.

Big Copper.—It is rumoured that the parties who purchased a half interest for $20,000 have taken up the other half at the same figure.

PROVIDENCE CAMP.

Gold Bug.—This is one of the properties owned by the Boundary Creek Mining and Milling Company. A force of men is at work sinking a shaft and driving a tunnel on the lead. The ore runs very high in gold and silver.

Velvet.—This claim is being worked and a fine showing of chalcopyrite is reported.

SKYLARK CAMP.

Last Chance.—Sinking of the shaft is still in progress.

WELLINGTON CAMP.

Winnipeg.—The work is confined to drifting and cross-cutting. The drifts are looking well.

Golden Crown.—The shaft is being sunk another 100 feet.

Hartford Fraction.—It is reported that a deal is on for the purchase of this property.

GREENWOOD CAMP.

Brooklyn and Stemwinder.—Underground work has been suspended since the enforcement of the eight-hour law. Some surface work is being carried on.

Ironsides.—Sinking is still in progress.

Knob Hill.—The tunnel cross-cutting the ledge is being continued.

Snowshoe.—The new machinery has been installed and work in the shaft begun.

War Eagle.—A crew of men are at work here sinking a shaft. Mr. Joyce, late of Rossland, is in charge.

DEADWOOD CAMP.

Mother Lode.—The shaft is being sunk another 100 feet. A drift is being run to connect with the winze in the tunnel. Mr. Johns has resigned the superintendency to take charge of the operations on the Sunset.

Sunset.—An order has been placed with Mr. Jas. D. Sword, of the Jas. Cooper Mfg Co., of Montreal, for two 80 h. p. boilers, one 75 h. p. hoist, a 20-drill compressor and ten machine drills. A working shaft will be sunk. The company operating this property have over $100,000 in the treasury for development purposes.

Buckhorn.—A waggon road has been made connecting this property with the main Copper Camp road. A force of men is now at work sinking a shaft on the ledge. Mr. Joyce is in charge.

Iron Top.—Work is still going on here and a good showing is reported.

GREENWOOD, 15th July. H. L.

The Queen Bess Proprietary.—The report of the directors of the Queen Bess Proprietary Company, Ltd., for the period from 22nd September, 1897, to 31st March last, to be presented at the meeting to be held in London on 13th inst., states that a net profit has been earned of £9,548, from which has already been paid an interim dividend of 6d. per share, absorbing £2,500, and leaving an available balance of £7,048. This the Directors recommend should be appropriated as follows:—In payment of a further dividend of 6d. per share, £2,500; in writing off one-third of the total amount spent on development work at the mine, £2,728; in payment to the directors of 5 per cent. on the dividends paid (£5,000), £250; in payment to the late managing director under the terms of his agreement with the company of 1 per cent. on the dividends paid, £50; and carry forward to next account £1,520—£7,048. The directors think that the result is satisfactory, especially when the fact is taken into consideration that until the past winter no regular shipments of ore were made as, acting under the advice of the engineer in charge, the energies of the management were till then largely directed to the opening up and development of the mine. At 31st March last a total of over 3,500 feet of tunnelling had been completed besides a large amount of work done in putting in the necessary upraises and winzes to connect the various levels. Ore was being stoped in each of the five levels, and to give some idea of the capacity of the mine it may be mentioned that the ore shipped in the month of March, 1899, was 763 tons. The output for the period under review averaged a gross value of £14 per ton, the average cost of mining, sorting, haulage, &c., was £3 6s. 8d. per ton, and the average cost of freight, treatment and duty was £6 9s. 9d, making together £9 16s. 5d., and leaving a profit per ton of £4 11s. Recent returns from the mine show that considerable reductions have been made in the cost per ton of mining, and also in the freight and treatment charges. Further economies are also being effected in the general administration of the company's affairs. The total amount spent on development to 31st March last amounts to £8,183, and notwithstanding the fact that this development has opened out large bodies of ore ready for stoping, the directors have thought it wise to write off one third of the total amount expended against the proceeds of the ore already mined. Two of the directors—Messrs. John Visger Miller and Charles Kingsley Millbourne—have resigned their seats on the Board, and Messrs. Robert Bruce Archibald and Charles Sinclair Drummond have been duly appointed directors of the company to fill the vacancies so created. Mr. C. K. Millbourne has also resigned his position as managing director in British Columbia, and Capt. T. J. Duncan has been appointed general manager in British Columbia. The shareholders will be asked to confirm the allotment to Mr. Charles Kingsley Millbourne of 1,500 fully-paid shares as nominee of the Dominion Mining Development Agency Company, Limited.

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To decide which type of boiler will produce steam at the lowest cost, it is necessary to consider the cost of the boiler, the evaporation of water per pound of fuel and the expense of keeping the boiler in working order.

Compare our boiler, the "Mumford Improved," with a water tube boiler and it will be found that ours has the advantage in all these points.

Cost.—Our boiler costs less on account of its simpler construction.

Evaporation.—Our boiler is internally fired and therefore more heat is absorbed by the water. The water circulation, an important factor in evaporation, is similar to and probably more rapid than that of a water tube boiler. Tests made by disinterested parties with the same coal resulted in favor of our boiler.

Expense.—The furnace of a water tube boiler requires relining with firebrick frequently, a large item of expense which is not required with our boiler.