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Established 1882

Vol. XIX—No. VII. OTTAWA, JULY 31st, 1900. Vol. XIX—No. VII.

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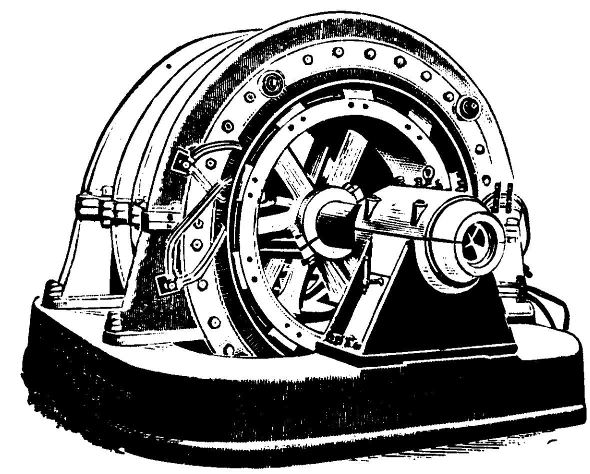

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B. T. A. BELL, Editor and Proprietor. Secretary, Canadian Mining Institute, etc. | Published Monthly. | OFFICES { Slater Building, Ottawa; Windsor Hotel, Montreal.

VOL. XIX., No. 7. JULY, 1900. VOL. XIX., No. 7.

Science and Industrial Development.

It is with pleasure that we note signs of increased activity this summer both in the Dominion Geological Survey and in the exploration work of the Ontario Bureau of Mines. The work of the former has long suffered from the paucity of the annual vote The government represents the people, and the people are sometimes slow to understand the necessary connection between this scientific work and industrial progress. The people at large want something *practical*, by which they mean something which yields immediate results in dollars and cents. They are right in part. They are right in so far as they demand that scientific work and principles should be so applied as to bring material profit to those living now. But they are wrong if they make this exclude expenditure of energy and money upon scientific work which may not yield profit until the next generation comes on the scene. We of this generation are reaping the fruit of such labor of the past. A good instance is to be seen in the modern uses of electricity. Founding on the beautiful experiments of Faraday, a number of physicists (Thomson, Maxwell, Helmholz and others) worked out in detail the theory of the dynamo, motor, &c., long before these machines began to influence our modern life. The almost miraculously rapid development of the use of electricity during the last quarter of this century was made possible by these purely theoretical investigatisos. The theoretical and the practical must go hand in hand. The one stimulates and helps the other, and each languishes if separated from its fellow. Therefore, we are pleased to see that our Governments are sending out parties, some of which are directed to extend our knowledge of the geology, climate and topographical features of our country, while others have been asked to do work from which we may hope to reap immediate results. It is the second kind of work that we wish more particularly to notice.

It is now apparent that Canada is destined to become a country of considerable importance for her mining and metallurgical industries. There is much inflation and there will be manya collapse. Mines will continue to be equipped before they are developed, smelting furnaces and mills will be built in the wrong places, and companies will be over-capitalised; but our mineral industries are solid enough to stand a fair share of all these. They would be in a much better position, however, to meet all contingencies, if our governments and investors were more wide-awake to the fact that the country needs our very best men for this work all along the line, as investigators, as instructors, as explorers and as managers. This emplies adequate salaries. The country that starves its engineers, its geologists and its explorers, is starving its industrial progress.

As an instance of immediate results from scientific exploration of a mineral region we may take Ontario Corundum. The history of its discovery by Mr. W. F. Ferrier of the Dominion Geological Survey is well known. With commendable promptitude the Ontario Government sent Professor W. G. Miller to examine the whole district from an economic standpoint. The reports* of Professor Miller and his colleagues have done more to advertise Ontario and her mineral resources than all the advertising of the usual kind, and as an immediate consequence of this fine piece of scientific work, corundum mining is now being carried on by a strong company, the Canada Corundum Company Many less striking instances might be cited; for example, the best prospectors constantly use the geological maps of the areas over which they are working. The mapping of the Sudbury, the Lake of the Woods, the gold and coal fields of Nova Scotia, the asbestos areas of Quebec, the Kootenays, and other important mining districts has thus led to more rapid and certain exploration. But the *science* of prospecting is yet to be formulated. As it is ordinarily done it is pretty much guess work. That there *is* a science of prospecting the economic geologist assures us. Would it not pay to have more of that kind done? We are credibly informed that a man who has the knack, and who has also the scientific knowledge, will explore as much territory in a month as a man with the knack but without the science will get over in a whole summer, and moreover the trained man will do his work better.

For sure and rapid indnstrial progress there must be full and hearty co-operation between capital, government and science. Capital must seek the advice of the best science of its time, and must uphold the government in the expenditure of public money to forward scientific education and research. Governments should safeguard capital and encourage enterprise by carefully considered legislation; and should not stint those departments of the public service more immediately connected with industries. Science should be applied as rapidly as possible; and those scientific students who show most aptitude in this direction should have it in their power to pursue their studies and investigations to the best advantage

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Our congratulations to the shareholders of Consolidated Cariboo Hydraulic on their first wash-up this season. The total yield for 62 days washing with 2,500 in. of water was 7,897 ounces, valued at $135,275.00.

*Vols. VII and VIII of the Reports of the Bureau of Mines.

The Present Condition of the Acetylene Industry.

It is now about six years since the commercial manufacture of acetylene was rendered possible by the improved calcium carbide process devised by Mr. T. L. Willson. Although Mr. Willson began this work in the United States, he later removed his factory to Ontario; and as he is a Canadian by birth and education, the acetylene industry is of peculiar interest to Canadians. The process of manufacturing calcium carbide is now well known. It is sufficient to recall that the raw materials, limestone and coke, are easily and cheaply obtainable in many parts of Canada A cheap source of electricity in our unlimited waterpowers gives Canadian manufacturers of calcium carbide an advantage which is evidently realized by investors, if we can judge by the amount of waterpower which is reported as being of late made available for that purpose. The Wilson Company is using about 2,000 electrical horse power at St. Catharines: the Ottawa Carbide Company will have at least 6,000 available, and the Shawinigan Company propose to devote 30,000 to the manufacture of calcium carbide. The total of these three alone exceeds by 16,500 e. h. p. the amount in use in France in 1899, in which year France had 21 carbide factories in operation and 5 in course of erection (see article on "Calcium Carbide," by Mr. John B. C. Kershaw, in *Mineral Industries* for 1899). During that year, too, these factories did not use all their available power, amounting to 50,300 e. h. p. In Europe, France and Switzerland lead in this manufacture, with Austria, Germany, and Italy following closely. In all these countries labor is cheaper than it is in Canada; but the cost of labor is only about 10 per cent. of the total cost of production (see Kershaw's article); while electricity costs 24 per cent. Lime and coke come to another 24 per cent. These conditions seem favorable to the manufacture in Canada and the United States. But careful estimates show that the cost of manufacture at representative factories in Europe is about the same as in America, viz.: about $35.00 a ton. The high selling prices one sees quoted (from $80 to $125) seem to be due in part at least to cost of transport. It has been stated, however, that the demand is increasing so rapidly that the supply is inadequate to meet it. Many of the smaller factories in Europe are obliged to close down during the summer owing to lack of water. We note here, by the way, that published estimates of available horse power from waterfalls and rapids do not usually state whether the estimate is for maximum or minimum flow. Both should be given. The estimates prepared by the Ottawa Board of Trade for Ottawa and the surrounding country show that the proportion of power at high water to that at low is about as 3½ to 1. Here is a piece of work which might well form the subject of a monograph. We commend to our Governments the advisability of having careful estimates made of Canadian water-powers, and the way in which their amount is or may be influenced by rainfall, evaporation, ground and surface storage, destruction and growth of forests, etc. The Geological Survey of the State of New Jersey published such a monograph in 1894. Surely Canada can afford to begin now, when the applications of water-powers are extending so rapidly. The publication of such a monograph or series of monographs, would call the attention of Europe more decidedly to the fine field for manufacture here. However, investors in carbide manufacture should proceed cautiously, as the cost of distribution is stated to be a serious check upon its extensive manufacture in one place.

Among the newer processes for the manufacture of carbide is that originally patented for phosphorous alone by Robinson & Readman, in which phosphorous and carbide are produced at the same time by reduction of apatite and other phosphates with coke or coal in an electric furnace. We are unable to learn whether this process is at this date being used with the production of carbide as a by-product, although an electrical process is being successfully used for the manufacture of phosphorus.

Limb (French Patent No. 294,727) heats in an electric furnace a mixture of barium sulphide (barite may be used), charcoal and a cheap metal. Barium carbide and a metal sulphide result. When the mass is treated with water, acetylene gas is given off, and barium hydroxide (hydrate) remains as a valuable by-product, easily separated from the compound of sulphur and metal. If this process succeeds it may lead to a use for deposits of barite and celestite. Large quantities of the latter are found near Gananoque.

The manufacture of acetylene gas from calcium carbide is theoretically a simple matter. In practice its manufacture and use are attended by certain dangers due to peculiar impurities When these are removed, acetylene gas has been shown to be as safe as other varieties of burning gas, when used with the same care. When accidents occur they are due either to imperfect purification or (in the great majority of cases) to the use of automatic apparatus which allows the temperature to rise too high or gas to escape into the atmosphere.

Acetylene gas can hardly be considered a general competitor with coal gas, water gas, or the other cheaper illuminants, but its use is certainly extending for the lighting of mines, villages, small towns, railway stations and other situations where the erection of a gas plant of the ordinary type would be impracticable.

The Passing of the "War Eagle."

We had occasion more than a year ago to criticise the annual report of the War Eagle Con. Mining and Development Company, and more recently to condemn the methods adopted by the directorate, or at any rate those actively engaged in the control of the company's affairs. The attitude we assumed, whilst generally accepted by the mining world, was resented by those who were the subjects of criticism, and it will be fresh in the memory of our readers that very strongly worded manifestoes were issued to reassure the shareholders and the investing public. They were assured that the position of affairs had been misrepresented, the mine was as good as ever, the lower levels (numbers 5 and 6 were then the lowest) showed richer ore than the upper, profit would be "prodigious" when the new hoisting machinery was in position Then, when the shut-down came, we were told that it was due to "defective machinery" and "labor troubles," and at the last annual meeting the chairman asked for renewed confidence, and declared that "the mine was all right," and if left alone the directors would practically guarantee satisfactory results.

Certainly the directors cannot complain of the attitude of the shareholders, for in spite of a condition of affairs which would have destroyed every vestige of confidence on the part of ninety-nine men out of a hundred, and which was so notoriously rank that it was condemned by the Stock Exchange and the public press, they were left to pursue the even tenor of their way and to steer the ship, as they promised, to the desired haven of success.

One result, however, which the astute directors expected did not follow. Their soothing syrup failed to allay the uncomfortable feeling which had been engendered by their former action; the pain was acute, but the antidote failed to work, and the price of stock did not go up, in fact it went down, and has stayed down ever since, hovering between 140 and 150.

This result was largely due to the straightforward report of the newly-appointed manager, who boldly took the bull by the horns, and in his report told the directors that the upper levels were practically exhausted, that the development on the lower levels was very limited, that at least six months must elapse before sufficient development work could be done to prepare the mine for shipping, and that after that the output must be limited to 50,000 tons a year. This meant practically

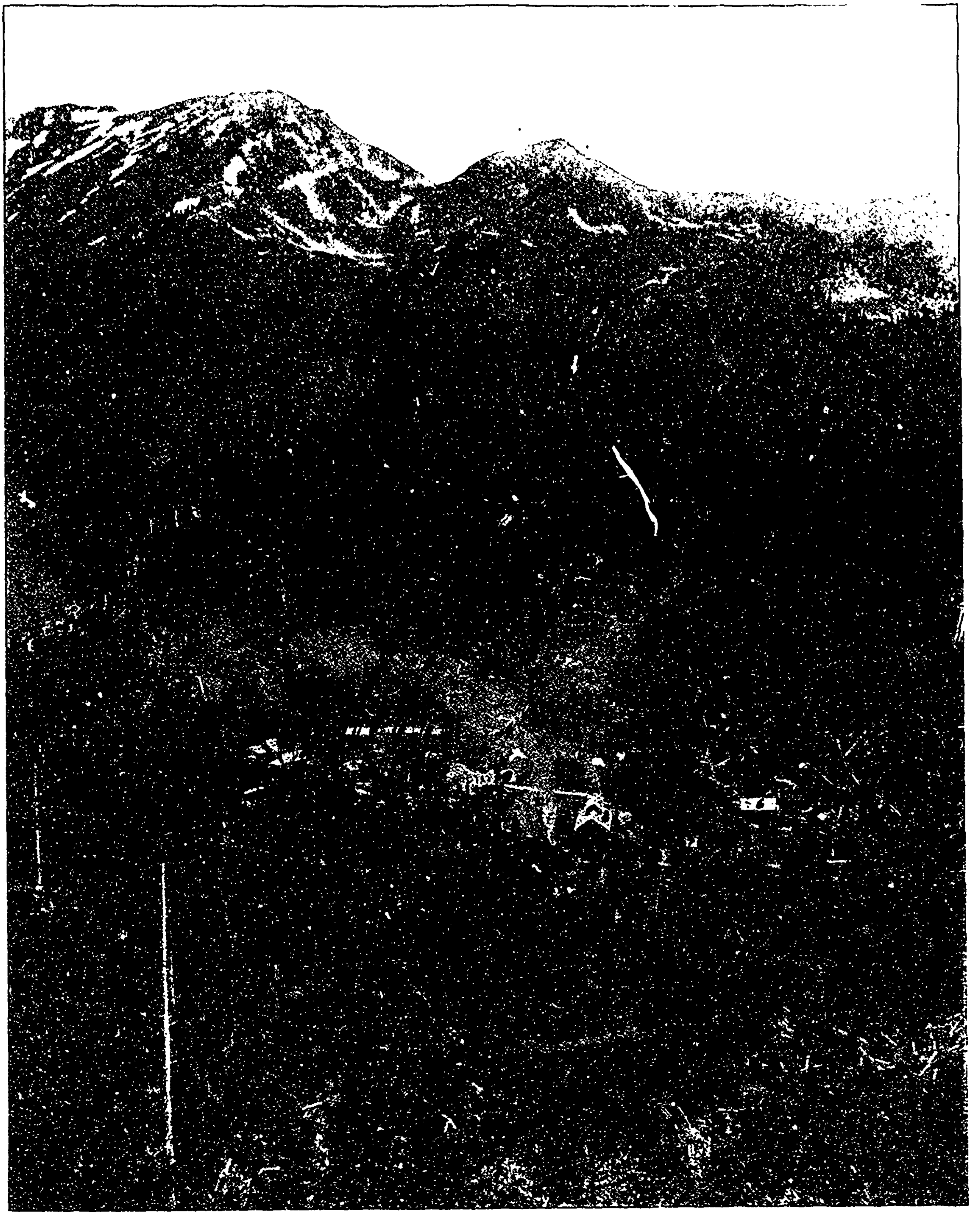

PHOTO OF THE WORKINGS OF THE JACKSON MINES, TAKEN IN 1899, FROM A POINT ON THE "KOOTENAY STAR" CLAIM, 700 FEET ABOVE THE WORKINGS.

Tunnel No. 1. 2. Tunnel No. 2.
Tunnel No. 3.
Tunnel No. 4, and Stables.
Tunnel No. 5. (Tunnel No. 5 and Jackson Creek at bottom of valley are hidden from view by the timber)
Office and Superintendent's quarters, 45 x 15 ft.
Assay Office.
8. Concentrator, 85 x 40 ft.
9. Shaft House and Steam Plant.
10. Mess House, 60 x 20 ft. (Only 40 x 20 ft. now completed.
11, 12, 13, Men's quarters.
14. Foreman's House.
15. Flume.
16. Dam in Jackson Creek to supply flume.
17. Line of Power Transmission from waterwheel.
18. Dublin Queen workings.
19. Continuation of main Jackson vein, recently opened.
20. S.W. corner of Dublin Queen.
21. N.W. " " "

that they had no mine, and that the future depended entirely upon the value and extent of the ore remaining to be proved in the lower levels.

It was pointed out by a correspondent that even if this ore turned out to be of as high an average value as in the previous workings, an output such as Mr. Kirby recommended, would only enable a 5 p.c. profit to be realized on the capital at par, and that depended upon a more or less doubtful contingency. No wonder that, realizing the hopelessness of the case, a report was judiciously circulated that an amalgamation would be effected with Centre Star; but this feeler produced an unexpected result, and had to be dropped, for memories of a similar "coup" in the case of Monte Cristo and War Eagle were revived, and the relative values of Centre Star and War Eagle stock so accurately assessed by the critics placing the former at $1.50 and the latter at $1, that it was seen at once that such a valuation confirmed all that had been said to its detriment.

This was the state of affairs shortly after the annual meeting in March. Now, let us see what has transpired since. Development work has progressed, but on a much more limited scale than was anticipated. The weekly returns, as given in the *Rossland Miner*, show a small staff of men compared with what was required by the urgency of the position, and the necessity for shipping as early as possible. The number has varied from 50 to 150, when it must have been at least double to have lived up to expectations. Why is this? The labor troubles were settled long ago, and there has been no scarcity of men. The reason is not far to seek, and is a full confirmation of our statements. *The upper levels are exhausted, and the lower levels have failed to yield sufficient ore to employ more men.* The report for the week ending July 7 stated that development was proceeding on "the sixth and seventh levels." What about the fifth? And the report for July 14 contains this significant statement: "On the seventh level cross cutting continues to the north and south veins, and is expected to reach the north vein in about ten days. On the sixth level cross cutting proceeds northward from the east drift. *The west drift on the south vein has been discontinued*, and a raise has been begun on a shoot of ore struck in the west end of the drift." No mention of development on the fifth level, and a discontinuance of the seventh level westwards, which has hitherto yielded higher values than the east.

Meanwhile time is passing, there appears little likelihood of shipping in July as promised, and in any case it is clear that the result of the last few months work has failed to redeem the character of the mine. We deduce from the facts which have been made public and from the information which has leaked out that events have more than justified the adverse criticism of last March, and as we have been taunted with "being wise after the event," we propose to "take time by the forelock" and warn the public in general, and mining investors in particular, to look out for another "rosy" manifesto when shipping recommences, with much bathos about high grade ore and "prodigious profits," followed by a speedy collapse.

International Mining Convention at Sydney, C.B.

Next month Cape Breton will be the scene of perhaps the most important gathering of mining engineers and mining men that has been held in Canada, the occasion being the joint meetings and excursions of the American Institute of Mining Engineers, the Canadian Mining Institute and the Mining Society of Nova Scotia. The details of these excursions, which have been organized on the initiative of the Canadian Mining Institute, with the co-operation of the officers and members of the Mining Society, are as follows:—

A special train, composed of Pullman sleepers, dining car, baggage car, etc., will leave Levis, Que., on the evening of Sunday, 19th August, and proceed direct to Sydney, Cape Breton, arriving there on Monday evening. At Truro the party will be joined by the members of the Mining Society of Nova Scotia.

Tuesday, August 21st.—By courtesy of the officers of the Dominion Iron and Steel Co., and the Dominion Coal Co., members will be conducted over the extensive new iron and steel works in course of construction at Sydney, and a visit will be paid to the shipping piers and coal handling plants. In the evening a reception will be tendered on behalf of the Mayor and Council of Sydney, and one or two papers will be read.

Wednesday, August 22nd.—By courtesy of Mr. H. M. Whitney and officers of the Dominion Coal Co., an excursion will be made over the Sydney and Louisburg Railway, visiting the various collieries and works of the company on the line of railway, and, if time permits, an inspection of the historic Port of Louisburg.

Thursday, August 23rd.—There will be an excursion by steamer through the beautiful Bras d'Or Lakes, rejoining the special train at Port Mulgrave; thence on to New Glasgow.

Friday, August 24th.—By courtesy of the officers of the Nova Scotia Steel Co., Limited, the Intercolonial Coal Co., Limited, and Acadia Coal Co., Limited, visits of inspection will be made to the works of these companies on Friday and Saturday.

Satnrday, August 25th.—Party will arrive at Halifax.

Sunday, August 26th.—By courtesy of the officers and members of the Mining Society of Nova Scotia, the party will be entertained to a drive, visiting various points of interest in and around the city, and, f po ssible, an opportunity will also be given of inspecting the warships n the harbour.

Monday, August 27th.—By courtesy of the Mining Society, the members will be entertained to an excursion in the harbour, visiting by steamer the Basin and North-West Arm, and other points, stopping, en route, at the works of the People's Light and Heat Company, Limited. In the evening a promenade concert in the Public Gardens will be given in honor of the visitors.

Tuesday, August 28th.—Drive to the gold mines at Waverley, where the party will be entertained to luncheon.

Wednesday, August 29th.—Special train will return to Levis.

The following side excursions have been arranged for:—

City of Sherbrooke, Que.—Members *en route* to Levis are invited by the Mayor and Corporation of the City of Sherbrooke to stop off there, on Saturday, 18th August, and participate in a series of entertainments being provided for them and the American Institute of Mining Engineers. These include a drive through the city, visits to the large mining machinery establishments of the Canadian Rand Drill Co., the Jenckes Machine Co., and other works, a luncheon, etc. Members participating in this excursion will rejoin train for Quebec in time to reach that point the same evening.

Excursion to Newfoundland.—For those who desire to go, arrangements will be made to convey a party, not to exceed twenty-five, *via* s.s. Bruce, from Sydney to Port aux Basques, connecting there with the Newfoundland Railway, over which, by courtesy of Mr. R. B. Reid, they will be given free transportation to St. John's. From this point Mr. Whitney, President of the Dominion Coal Co., will convey them to the celebrated Wabana Iron Mines, on Conception Bay, and will return them free of charge to Sydney by one of his steamers.

Special Railway Rates.—By special arrangements made with the Canadian Pacific, Grand Trunk, Intercolonial, Quebec Central and Canada Atlantic Railways, members will be carried to Quebec from points on these lines for *a Single Fare*, on obtaining the usual form of Convention Certificate, and on having same signed at Sydney by Mr. B. T. A. Bell, Secretary of the Canadian Mining Institute.

The special train will be side-tracked at Sydney, New Glasgow, Halifax and other points, and members will live on the cars. A special baggage car will be provided, to which members of the party will have access at all hours of the day and evening. Reservations for accommodation on this train will only be held for those who make application for them on or before, *but not later*, than the 10th of August next, and location of berths will be made by priority of application.

From the returns received, quite 200 mining men will participate in this important outing, an event which should do much towards advertising the mineral industries and mining resources of Nova Scotia. In connection with the event a handsomely illustrated souvenir programme containing much serviceable information is being prepared.

British Columbia in 1899.

We are still awaiting the advent of the boom in British Columbia, which was to have made its appearance as far back as two years ago. By this time, however, the patience of everybody has become wellnigh exhausted, and, with the exception of one or two optimistic ones here and there, the prediction is quite forgotten. British Columbia, as far as public interest in it is concerned, has been quite relegated to the back ground, and there is no foreseeing when that interest will be revived. At any rate, there will be no great attention paid to the colony for some time to come, and as for a "boom," that is altogether unlikely for at least another two or three years. We have yet to finish the war in South Africa, and when that happy time arrives public interest will be immediately directed to this part of the world, and there it will be mainly concentrated for a long time to come. And even that depends in a principal measure upon the international outlook. Until the present threatening situation in China is peaceably settled the public will not be inclined to take any great interest in any goldfield, not even in the Rand, and certainly not in British Columbia. It is pleasing to find, however, that even without any active outward assistance this goldfield is still making slow and sure progress, a fact that is revealed in the pages of the annual report for 1899. In looking at the mineral production for the year, it is gratifying to notice that the principal feature of it is the increase in the output of the mines, notwithstanding that many have, for one reason or another, temporarily or permanently shut down, these being chiefly silver mines. The mineral output altogether amounted to $12,356,555, as against $10,906,861 for the previous year, or an increase of $1,449,694, which is the more creditable when we bear in mind that the shutting down of mines has been responsible for a falling off of $910,844 in silver and lead values alone. "There is every reason," says the report, "that but for this shutting down we would have had from these same mines an increase of $500,000 in place of the present deficit, which would have brought the year's increase to $2,863,159, or about 27 per cent. over last year." Dealing, first of all, with the gold production, we find that this—including both placer and lode gold—amounted to $4,202,473, which is unique, inasmuch as never before in the history of the colony has the output reached the 4,000,000 mark. The nearest approach to it was in the year 1863, when the production was $3,913,563, and in 1899, therefore, leads any previous year by $288,910. The output of the metal from lode mining was $2,857,573, an increase over 1898 of $656,356, due chiefly to the greatly increased tonnage from Rossland and the Ymir Mines in the Nelson division. The Lillooet division has contributed $27,000 worth, whereas in the Osoyoos district there has been a decrease of about 30 per cent., which is accounted for by the fact that most of the producing mines confined themselves largely to development work, in anticipation of the railway facilities expected in the near future, and the consequent cheapening of freights and supplies. The production of gold from lode mining has been obtained approximately as follows:—

From direct smelting	$2,166,000
" combined amalgamation and concentrating	600,000
" cyanide process	91,000
Total	$2,857,000

The yield of placer gold amounted to $1,344,900, an amount not equalled during the last 12 years. This increase is due to the Atlin district, which entered the list for the first time as a serious producer, its contribution amounting to $800,000. But, on the whole, placer mining was not very successful in other parts of the province, largely owing, we are told, to an excessively wet season, which kept the rivers so constantly in flood that few could be worked. There was a fair amount of activity displayed in copper mining during the year, which is as yet confined to three districts—viz., Rossland, Nelson and the Coast. The production altogether amounted to 7,722,591 lbs., an increase of about 6 per cent. on the previous 12 months, but the increase in the actual value was as much as 55 per cent., owing, of course, to the good prices ruling for the metal. Rossland contributed as much as 75 per cent. of the total output, with 2,172,665 tons, but in the Nelson district there was a slight falling off, the Coast district accounting for the remainder. As we have already pointed out, the results of the silver mining industry are anything but gratifying, the statistics showing an unmistakeable retrogression. This is owing to the fact we have drawn attention to—that is, to the shutting down of some of the largest mines in the Slocan during the greater part of the year. The total tonnage of this district fell from 30,691 tons to 21,507 tons. The total silver production for the year amounted to 2,939,413 ounces, valued at $1,663,708, a decrease from the production in 1898 of 1,357,619 ounces of silver and of $712,133 in value. —*The Mining Journal.*

Velvet (Rossland) Mine.

I am not exaggerating when I say that I have been anticipating the issue of the prospectus of this company for the past two years. It would have been brought out before had not various members of the family group to which it belongs become rather notorious, and fouled the nest. In the article in another column on "Guinea Pigs on Velvet," it will be seen how disgracefully some of the members of the family have behaved. The parent was the New Goldfields of British Columbia, and the Velvet has for sisters and brothers such arrant wild-cats as the Klondyke Mining, Trading and Transport Corporation, New Fraser River Gold Mines, Bennett Lake and Klondyke Navigation Company, Klondyke Goldfields, and Maldon Goldfields (Vic.). During the past two years one or other of these concerns has been either discreditably figuring in the law courts or at Carey street, and only a few weeks ago I had to pass severe strictures upon the liquidation and amalgamation of three of the undertakings. The flotation of the Velvet had been put off and off until it has at last become impossible to postpone with safety any longer the appeal to the public for money. At any moment the parent itself may have to go into the Carey street workhouse. The present company owning the Velvet mine has a capital of £100,000, and the new company is formed with a capital of £200,000, of which £150,000 is payable (I beg the reader to note, that it is in shares) to the vendor company, and the balance of 50,000 shares are offered to the public for subscription. Now, the New Goldfields of British Columbia two years ago included the Velvet mine among its assets at a valuation of £150,000, and Sir Charles Tupper, the chairman, boasted at a meeting three years ago, that if the New Goldfields of

British Columbia was in a position to accept that amount of money for the Velvet mine, "its remaining hours would probably be only few." Since that time, if we are to believe the prospectus now before us, £20,000 has been expended in development work, machinery, and plant, so that the property should be worth £170,000, apart altogether from any results shown by development. Are we to believe that the directors are now generously accepting in shares what they were offered three years ago in cash, to say nothing of the £20,000 they have spent? Sir Charles Tupper repeated his statement in more explicit terms at a meeting of the parent company in 1898. He said:—

On the basis of the cash sale made to a financier in London of a one-fifth interest in the Velvet mine, the mine would bring at present to its owners a *cash* value which would more than cover the entire capital (£250,000) of the Goldfields of British Columbia.

In 1897 the cash value of the Velvet mine was £150,000; in 1898 the cash value was £250,000; in June, 1900, the scrip value is £150,000. What are we to make of these various statements? There are other points in the prospectus (which comes to the public without any independent report upon the mine), but these are sufficient, coupled with the record of the directors, referred to in the article elsewhere, to warn my readers not to touch the shares.—*The Critic.*

Book Review.

On the Sub-Divisions of the Carboniferous System in Eastern Canada, with Special Reference to the Position of the Union and Riversdale Formations of Nova Scotia, referred to the Devonian System by some Canadian Geologists. By H. M. Ami, M.A., D.Sc., F.G.S. of the Geological Survey of Canada. From the Transactions of the Nova Scotia Institute of Science, Vol X., Session 1899-1900.

This paper purports to give the evidence upon which maps of the counties of Pictou, Colchester, Cumberland and Hants have been so long withheld from publication by the Geological Survey, and is an expansion of part of the masterly address read by Dr. Whiteaves before the American Association last August.

"Where to draw the line between the Carboniferous and Devonian systems in Eastern Ontario is the question at issue."

The various life-zones can easily, Dr Ami maintains, be recognized, provided the fossils can be compared with standard sections recognized the world over. One grand section occurs at the Joggins, in Cumberland County, a systematic collection of the fossils of which ought to be made.

It is his purpose to enter this field of enquiry without any leaning or bias to any one view, but to take up the evidence as it was collected by him during the last four years.

Numerous and varied opinions have been given by many writers. These he does not attempt to review. They have but served to establish clearly the order of succession of the rocks of Union and Riversdale; while he has been able to arrive at a conclusion in regard to the fossils which is in accord with the views of the rest of the world.

The fossils are all akin to types in the productive Coal Measures. Dr Ami does not hesitate to state that the fauna and flora are remarkably similar in their palæontological characters to those of the Coal Measures of Nova Scotia. All the species of *Leaia* recorded in North America and all the species of *Anthracomya* from the United States are referred to the Coal Measures. Professor Prestwich notes no occurrence of amphibions in the Devonian. Dr. Millar, Professor Dana, Geikie, and other leading nomenclators concur in referring *Sauropus* and *Hylopus*, to which the writer has referred the footprints from Harrington River, to the Carboniferous.

It will thus be seen that all the types are such as are usually met with in the Coal Measures and the Union and Riversdale formations, placed by Dr. Ells, Mr. Fletcher and others in the Devonian, must, therefore, especially from the life-zones they hold, be classified as Eo-Carboniferous formation underlying the marine limestone.

Is this logical? If the fossils indicate that these rocks are Coal Measures, why call them Eo-Carboniferous rather than Devonian?

With them Dr. Ami would also include in the lower portion of the Carboniferous, the red rocks of Mispec and the Lancaster fern ledges of New Brunswick, placed by all geologists in the Devonian.

Has the author then misinterpreted his evidence, or are the various sub-divisions of the Carboniferous and Devonian systems indistinguishable by their fossils, or is the study of them still in its infancy? Some readjustment of the palæontological standards or an explanation of apparent contradiction seems necessary.

COAL MINING AND TRADE.

It is a striking fact that those nations which are the greatest producers of coal stand at the head of all others in the advancement of civilization and in material prosperity. This results largely from the fact that cheap and abundant fuel is essential to the permanent establishment of the industrial trades. We are too apt to lose sight of this and devote our attention to the precious metals, regardless of the fact that one coal mine is worth ten average gold mines as an employer of labor and a builder up of the community.

Whilst Canada has been bountifully endowed with mineral wealth of every kind, she is especially rich in her coal deposits, and nothing will make more surely for the development of the country than the fostering of industries which require large supplies of fuel, the provision of which will bring in its traiu that permanent white population which we so much need.

Fresh interest is excited in this subject by the controversy now being waged between the two political parties of the Dominion on the subject of preferential trade. Whether or not the Canadian Government will be able to induce the International Commission to report in favor of a small import on foreign wheat, and whether the mother country would accept such a recommendation are both very doubtful points. But in any event the "closer relations" can only have one issue, either an increased importation of English manufactured goods into Canada, or a reduction in the cost of production on this side.

It is inevitable that in a new country the establishment of such industries must be a slow process, and must be assisted financially and otherwise by legislative enactments. But all experience tends to show that as time passes these are gradually lessened, if not altogether withdrawn, and the industries become self-supporting. There are moral forces at work which make for this result and which nothing can withstand. Our neighbours across the line have "free trade" within their own empire and—in spite of occasional splurges in high tariff legislation by McKinley or Dingley—a gradually diminishing tariff against outsiders. To this result nothing has contributed more certainly than the economic handling of their natural resources. Their coal is notoriously the cheapest product of the kind in the world. For several years in succession, viz., 1896 to 1898, they were able to buy coke delivered at the blast furnace in Alabama for 90c. a ton. In these cases the coal must have been placed at the coke ovens for 40c. to 45c. There is a colliery at Scott-Haven, near Pittsburgh, with an average cost for last year of 55c., and in that district 60c. to 70c. is a common cost. Then there is the noticeable feature that the selling price is never more than a few cents above the cost of production, and the consequence is that the manufacturing industry gets the benefit of the cheapest possible fuel, and that is an important factor in the production of the $5 pig iron and $15 steel rail which has so perplexed European makers.

Even during the recent boom, when iron and steel went "out of sight," coal only had a moderate rise, and whilst in England it was forced up to $6 f.o.b., we find bituminous coal f.o.b. New York harbor $2.25, and on cars at Chicago $2.55, whilst Connellsville coke is quoted $2.50.

It is well known that the railway companies, keenly alive to the value of this policy as a producer of traffic, lend themselves to its development and carry coal and coke long distances to points of consumption, or shipment, for rates that appear almost nominal. Of course they have a population of 60,000,000 where we have only 5,000,000, but we are convinced that the solution of the problem—how to attract a permanent white population to Canada, and how to check the tide of emigration to the south—lies to a great extent in the direction we have indicated. In the cheapening of our raw products and the faster growth towards self-support of our large manufacturing industries; only in this way can we hope to develop a large population at home and capture a share of the trade abroad.

A striking commentary on the above conclusions is to be found in the following coal production for the year ending December, 1899, in metric tons:—

	Tons.	Value.
United Kingdom	250,085,000	$1.53
Germany	101,622,000	1.77
France	32,331,000	2.16
Belgium	21,918,000	2 11
United States	218,376,000	1.06

The exports of coal from the United States in May were 640,343 tons, being 185,573 tons or 40.8 per cent. over last year. Of this gain the bulk, 120,292 tons, went to Canada. The shipment to European ports was small, 25,882, showing that very little has yet been done in this direction.

Whilst considering coal statistics it may be interesting to note the gradual increase in the world's production during the last 80 years. It is as follows:—

	Metric Tons.
1820	17,000,000
1840	45,000,000
1850	83,000,000
1860	144,000,000
1864	174,000,000
1878	202,000,000
1896	604,000,000

During June the shipments of the Dominion Coal Co. aggregated 226,000, which is far ahead of any previous record. They shipped—

From March 1st to June 30th	645,000
Same period last year	431,000
And in 1898	334,187

This is an increase of 49 per cent. over 1899 and 93 per cent. over 1898.

Nova Scotia has an equally gratifying return for the first 5 months of 1900, 525,890; 1899, 283,844—an increase of 85 per cent.

The returns from the Pacific coast, although larger than last year, are left far behind by these "prodigious" figures from the Atlantic. The returns are as follows for June:—

Union and Extension	37,000
New Vancouver Coal Co.	41,000
Crow's Nest Pass Coal Co.	18,000
Total	96,000 tons.

The annual meeting of the Institution of Mining Engineers of Great Britain has recently been held in London, and some interesting papers were read, followed by still more interesting discussions. The newly elected President, Mr. H. C. Peoke, is a well known and very successful mining engineer and has been for more than 20 years the manager of the Walsall-Wood Colliery Co, Limited. His inaugural address contains much matter of interest. *Apropos* of the subject of the exhaustion of British coal fields he very pertinently suggests that attention might more profitably be directed to the economical use of fuel, adding the somewhat startling statement that only 10 per cent. of the useful effect of coal is realized in general use, and only 1 per cent. in domestic consumption. He emphasized the importance of cheaper production if England is to hold its own in the markets of the world, and suggested the following as the most obvious means of securing that end:—Secondary haulage, roller bearings for tubs, tipping coal direct on the picking belt, mechanical coal cutters, electric driven drills, steel girders in lieu of pit timber, and steel tubs.

Hitherto English or American mining engineers have enjoyed a monopoly of the profession in the far East, but the fate of those in China seems uncertain, as they have not been heard from since the Boxer troubles began, and the Japanese, with their characteristic ambition and adaptability, are going to try on their own account. Mr. A. Nomi, of the Namagata Colliery, Chikuzen, Japan, is making a tour of American mines to glean information which he will put into practice on his return.

The difficulty of using percussion cutters in a thin seam of coal has been solved by Mr. McCleary, Superintendent of the McCleary Coal Co., Limited, Gracetown, Pa. His seam is only 3 ft. 6 in. thick, but as it is all used for coking size is immaterial. He makes the usual undercut first, say, 1 ft 6 in. on the face, then elevates the machine and breaks down the upper portion of the coal. This does away with blasting, and is, on the whole, a saving. The method is worth noting.

A recent explosion at the Brandon Colliery, County Durham, has developed a very interesting fact, viz., that wet powder may "fizzle" through the squib hole and fire gas where dry powder would not do so. It is due to the "sparking" of the wet powder, and the discovery is likely to lead to further tests, as this is an unexpected addition to the many dangers attendant upon the process of blasting.

The time is rapidly drawing near when blasting in coal mines will be a thing of the past, and unless some entirely new disruptive agent be employed it looks as if all coal will be "got down" by coal cutting and shearing machinery, supplemented by the old wedge, acting on the plug and feather principle. There is, and always has been, but one objection to the abolition of blasting—increased cost; but recent occurrences have taught that we pay for slightly increased profits in precious lives, and the system will have to go, at any rate so far as known explosives, or indeed anything of their class is concerned. If liquid oxygen can do the trick, the sooner it comes to the front the better.

French importers have contracted for several cargoes of coal at $4.08 delivered at French ports. This confirms our figures of last month, and suggests the lines upon which Canadian owners should proceed.

Mr. W. H. Blauvet read a paper at the meeting of the Iron and Steel Institute in London on "Semet Solvay Coke Ovens at Wheeling, West Virginia," which elicited an interesting discussion, in the course of which Mr. A. L. Steavenson, who is one of the highest living authorities on coking, said that it was his opinion, confirmed by the users of coke produced by by-product ovens, that the coke was impaired by the process, and that no coke was so good for furnace purposes as the product of the bee-hive oven.

The Michigan coal basin is attracting much attention in coal mining circles and presents features of special interest. There are numerous seams of high-class bituminous coal, but the average thickness is only 2 ft. In spite of this, thanks chiefly to the use of mechanical appliances, the average cost is only \$1.31, and the average wage \$1.70. Machine runners receive \$2.30, and hand miners \$1.66. The labor is all "white," there are no Chinese or Slavs.

Sir Alfred Milner is warning miners of all grades not to rush to South Africa after the war is over as the labor market is already overstocked

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Colliery Surface Arrangements for the Delivery of Coal from Pit Cage into Railway Wagons, for a gross quantity of, say, 1,5C0 tons per day, Exclusive of Coal Washing and Coking.

By Mr. S. A. Everett.*

In order to deal successfully with a subject presenting such scope as this within the prescribed limits of the paper, it becomes necessary at the outset to lay down the lines on which it will be treated; and whilst avoiding as far as possible the introduction of matter which is either common knowledge, or which has already been set forth in text-books or other sources of information available to all, to infuse as much originality as the subject permits.

A typical case of colliery conditions in the South Wales district will be assumed; and whilst describing the best arrangement for the purpose stated in the title, digression will be made where necessary to advert to modifications or to other appliances deserving of special mention.

The object sought to be attained is to handle the coal with as little breakage as possible, sorting it into the required sizes and cleaning it as perfectly as possible, wlth the minimum of labour consistent with the employment of machinery of a simple character, not readily liable to derangement, or expensive in upkeep, and of low prime cost.

The design of this plant will be followed out with as much detail as space will permit, with the hope that the information given will be of assistance to the colliery engineers in carrying out similar work. At present they are too much in the hands of the manufacturers, who *themselves are far from possessing such an intimate acquaintance with* the necessities of the work as is essential for the production of a satisfactory plant, apart from the fact that their interests do not coincide with those of the colliery owners. The great divergence of design and specification submitted by various firms when asked to tender for a plant of which they are given only a broad outline, is sufficiently indicative of their inability to design work of this class, which shall conform to the requirements above laid down. And this is only what might be expected: the colliery engineer, not the manufacturer, should be the specialist, and should design in detail the work required.

The general scheme of the plant will be as follows:—The trams as they come from the cages will be weighed, then tipped over the usual colliers' or royalty fixed bar screen, which separates the "large" and the "billy." The large will be further separated into "large" and 'cobbles," the former being hand-picked, and loaded into wagons. The billy, for the sake of completeness, will be separated into "nuts," "beans," "peas," and "duff"; in most cases this process would be accompanied by a wet treatment for the removal of foreign matter, but as this does not come within the scope of the paper, the various sizes will be loaded directly, the object being to refer to appliances for the treatment of the smaller sizes, without which the Paper would be incomplete.

In determining the capacity of the plant it will be assumed that trams weighing 10 cwts. and carrying 25 cwts. of coal are used, and that the 1,500 tons have to be dealt with in a day of nine working hours. We thus have:

$$\text{Trams per day} = 1{,}500 \times \tfrac{20}{25} = 1{,}200$$
$$\text{" \quad " hour} = \tfrac{1200}{9} = 133\tfrac{1}{3}.$$

It would be injudicious to calculate upon the basis of a uniform delivery of trams from the pit; so, to meet contingencies, it will be advisable to reckon upon 150 trams per hour

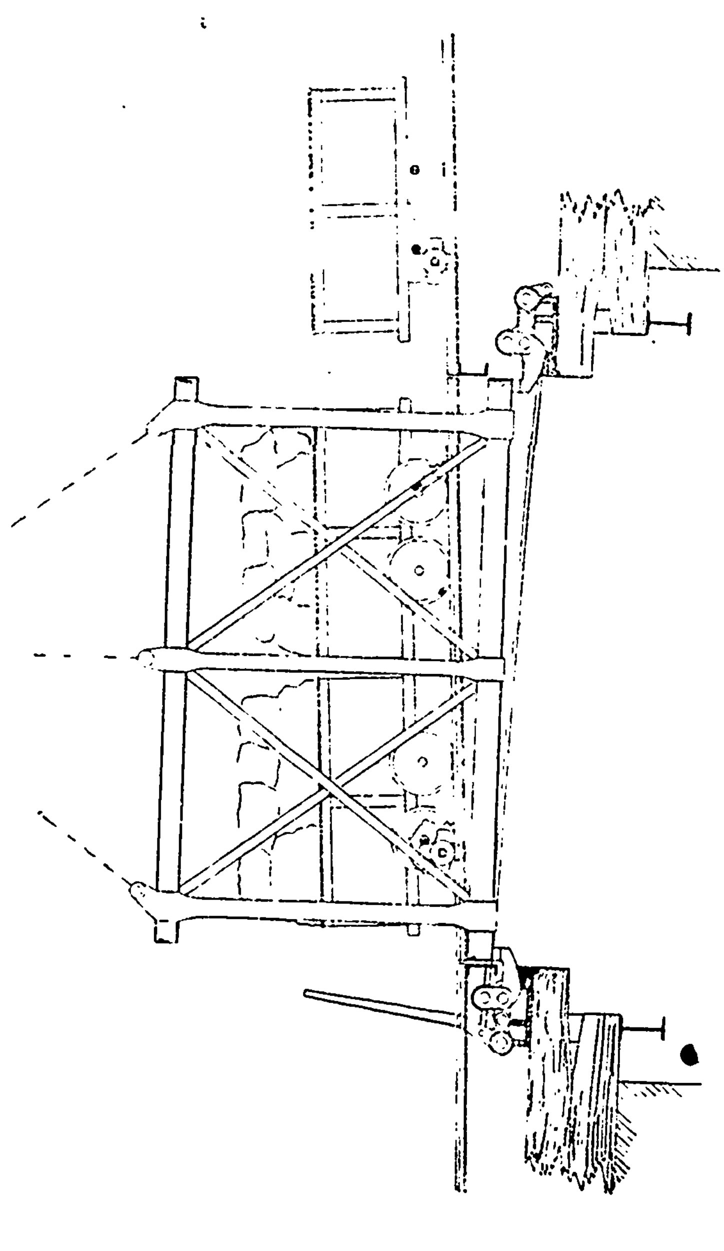
Assuming two trams to be raised in each cage, a wind will occupy

$$\frac{60}{\frac{150}{2}} \text{ minutes} = \tfrac{4}{5} \text{ minute} = 48 \text{ seconds.}$$

To wind so expeditiously as this from any considerable depth—say, over 400 yards—will necessitate the employment of banking appliances which will not involve the loss of more than five seconds in the operation of changing the trams, and these will be first considered.

To facilitate the discharge of the full trams from the cage, the bottom or rails may either be fixed at an inclination or hinged at or near one end, and made to tilt as the cage settles on the keps, so that the full trams are on a falling gradient. The former plan is preferable, and should be adopted in all cases where the circulation of the trams through the cages can be made in one direction only; that is, the full

Fig. 1.

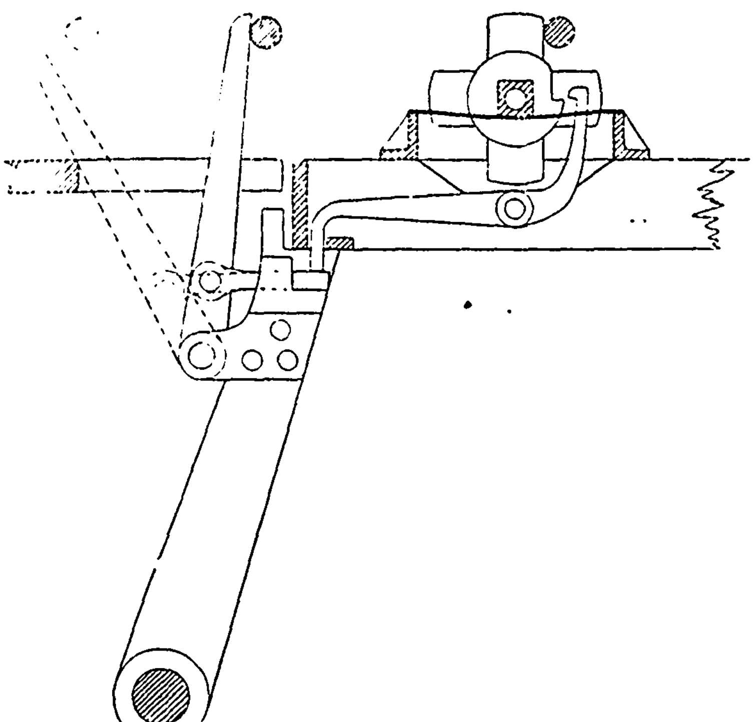


*Paper South Wales Institute of Engineers.

trams at the pit bottom enter the cage at the same end as the empties do at the surface, and leave it at bank by the opposite end. If fixed rails are used, the inclination, instead of being uniform throughout their length, should be steepest where the wheels rest, so that the trams get a strong impulse as soon as they are released; and flatter near the ends, where the entering empty tram requires its momentum diminished, and the full tram needs only sufficient force to sustain its motion.

The best automatic stop or catch for retaining the trams in the cages and releasing them at the right moment is that shown in Figs. 1 and 2. It consists of a four-armed wheel, which engages with the tram axles, fixed to the cage bottom at the outgoing end; this wheel has a cam on its spindle, and a detent which engages with it, and which when released permits the wheel to revolve under the action of the tram axles until two or four axles, as the case may be, have passed over, when the detent again locks it. To prevent the motion, as each

Fig. 2.



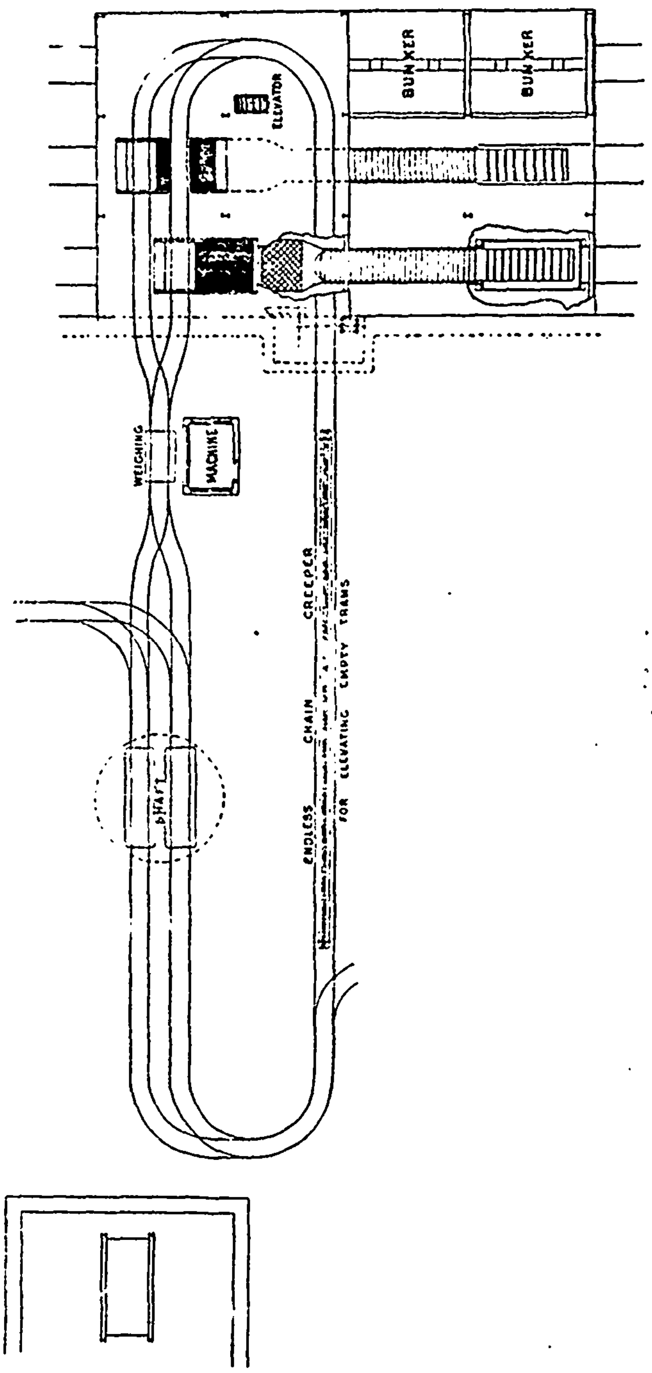
axle passes, being more than the required amount, a flat spring presses upon a square on the spindle of the wheel, so that the latter only moves ¼ revolution each time, and is lightly locked in the interval. In Fig. 1 the stop is shown in conjunction with keps of the Stauss (or Daniel & Luhe) type, which can be withdrawn from under the cage without rendering the lifting of the latter necessary. The projecting lever of the stop, on the upward motion of the cage through the keps, lifts up, and passes the lever fixed to the landing; but on the downward return of the cage the levers engage, and the stop lever is lifted until the detent releases the wheel when the stop lever trips past the the fixed lever just before the cage settles on the keps, and so the stop is ready for the entering trams.

If ordinary fangs are used, the same arrangement, modified as shown in Fig. 2, may still be used. The advantages of this stop over Fisher's catches are that it gives a more secure stop to the tram, it is more easily applied, it gives no backward jerk to the. tram or release; and if, as often occurs, an empty bond is sent up, it does not require resetting before the empty tram is allowed to run into the cage, as the star wheel does not revolve, and the detent falls back and locks the wheel.

In Fig 1 a similar arrangement of stop is applied at the empty side of the pit, and is actuated by the motion of the cage in a similar manner to that before described; by it the empty trams are automatically served into cages from the stock behind the pit, thus dispensing with all manual labour at the pit top except the banksman.

The roads from the pit to the screens should be laid with heavy section T head rails, not less than 30 lbs. to the yard; and ail points and crossings should be accurately built up of the same rails. Fig. 3 shows the general arrangement of the roads; after leaving the cages they converge to a single road, which leads on to the weighing machine. On the plate of the machine a stop should be placed to automatically detain each tram, its release being brought about either by the weigher or by the succeeding tram (Fig. 4). As it has been assumed that two trams are discharged from the cage at each wind,

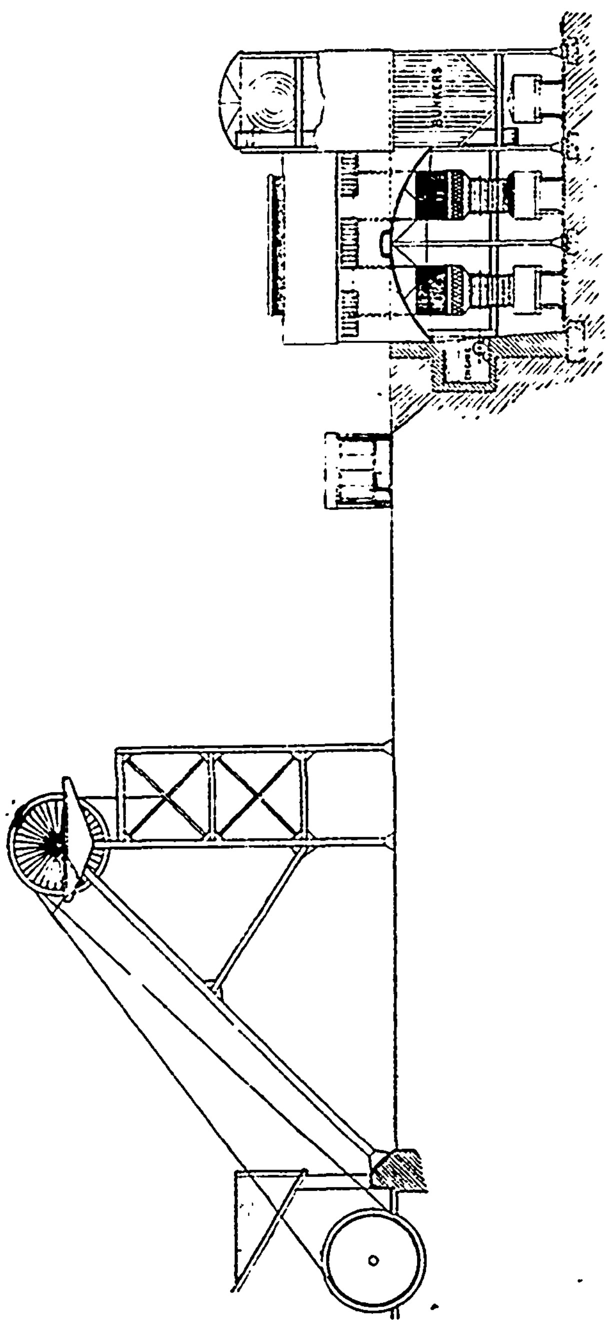
Fig. 3.



another stop between the pit and the weighbridge will be necessary to detain the second tram until the first has been weighed. The star wheel stop already described lends itself admirably to this purpose. In the case of the two trams, instead of being raised in one deck, being brought up in a double-decked cage, it will be assumed that an arrangement of lifts, or creepers, such as have already been described by various writers, exists to adjust them to the requisite levels.

The roads from the pit should be laid so that the trams gravitate downwards at an inclination of from ½ inch to 1 inch per yard, according to the kind of wheels in use, and the curves of the road; for instance, whilst ½ inch per yard may be ample to sustain the motion on straight runs, 1 inch per yard may be scarcely sufficient to start the trams off the weighbridge. If the trams have to travel a considerable distance from the pit to the screens, as in the case of the rearrangement of an existing colliery; or if the level of the present pit bank is too low or too high to suit the plant afterwards described, it will be advisable to employ some form of mechanical haulage. One of the best forms for this purpose is that described by Professor Galloway in his "Lectures on Mining" (illustrated in Figs. 19 to 24, p. 11, Subject No. 3—"Winding"). In place of the chain, a wire rope may with advantage be employed. In some cases of light drives, a leather strap working over rollers, and provided at intervals with catches to engage with the tram axles, is successfully applied to this work. Even if the trams have to run a long distance on a falling gradient, it will be found preferable to employ a positive control over their motion, rather than to endeavour to adjust the gradient for them

FIG. 3A.



to run unassisted; for the coefficient of friction for all not being the same, an incline down which some will run with undue velocity will scarcely suffice to move others; and if in the open this gradient will not be equally suitable in dry and in wet weather. If possible, this chain or other haulage should be laid out to exert a driving or retarding force on the trams at all points, and not have to propel in places and hold back elsewhere.

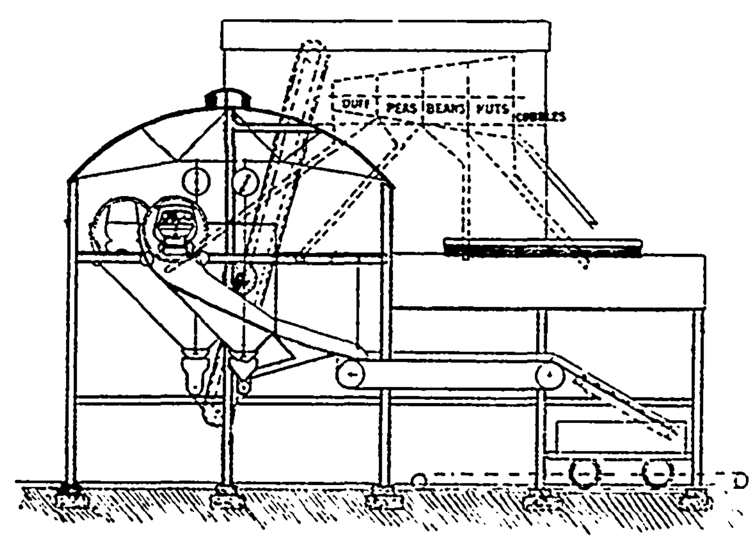
To suit existing circumstances, the haulage may have to be applied before the weighbridge is reached; it may then be utilised instead of a stop on the machine by making the rails on the machine table slightly dished at the centre, so that the tram stands there, enabling the weigher by means of a foot lever to raise or depress a section of the haulage chain where it crosses the weighbridge, so that it first leaves the tram as the latter reaches the machine, and then, when raised by the lever, again engages with it, and takes it on towards the screens. Or, the haulage chain may stop at the machine, and each tram in its turn be made to push the preceding one off the table before it disengages from the chain.

The situation of the weighing machine is a matter of some importance; if it is so placed that a direct sight can be obtained of the "billy" dials, one weigher will be able to take the weights not only of the gross, but of the "billy" too, as there will be ample time for both operations.

Following the trams on their course, they next come to the points where the roads diverge to the two tipplers; these points can be made self-acting to alternately serve the two tipplers with trams. Fig. 5 shows the arrangement, and explains itself. The empty trams leaving the tipplers have next to be returned to the pit top; the roads are best arranged in curves, as shown in Fig. 3, but if sufficient room is not available, a back shunt may be substituted. Upon the straight length of road a creeper for conveying the trams back to the pit against the adverse gradient is inserted.

The screening plant next demands consideration. Fig. 3 is an outline sketch of the scheme most suitable for the case in hand. The trams are tripped on to a "royalty" or "colliers'" screen, with fixed bars, which separates the "billy"; the large coal is further treated on a moving screen which separates the cobbles from it; it is then picked clean on a belt, and loaded into wagons. The cobbles, which form but an inconsiderable proportion of the output, will not demand a

FIG. 3B.

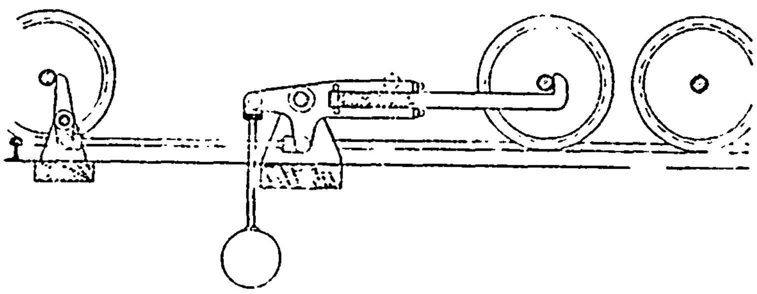


separate road to be loaded on, so they will be returned to the "billy" and conveyed with it to an elevator which will raise the coal to such a height that when screened the various sizes can be conveniently stored in bunkers and loaded into wagons as required. The question whether it is expedient to separate out the cobbles from the large is a debatable one; the quality of the large coal, and consequently the price it fetches in the market, may be a little enhanced by its superior uniformly large size; but unless the cobbles command a value almost equal to that of the large coal it is questionable whether the process is an advantageous one The separation of the cobbles, like the classification of the "billy," is introduced here more with a view of adding to the completeness of the Paper than of advocating its general adoption.

The plant will now be considered in detail.

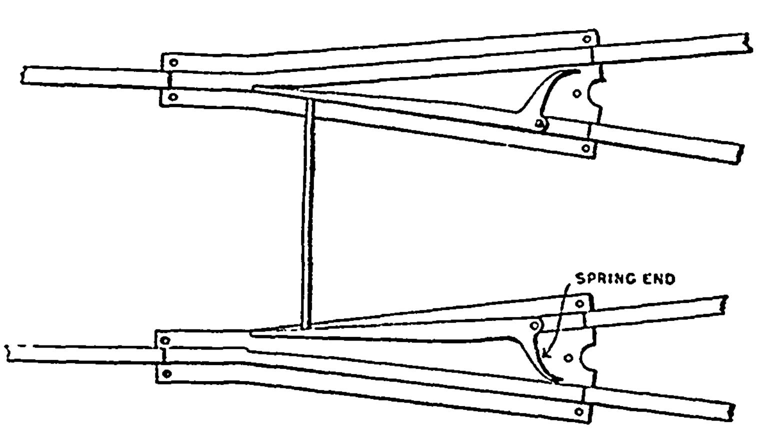
Two tipplers will be required for dealing with two trams every forty eight seconds. The rotary side tippler is now by all conceded to be the best form, as it does less damage to the coal, is more

FIG. 4.



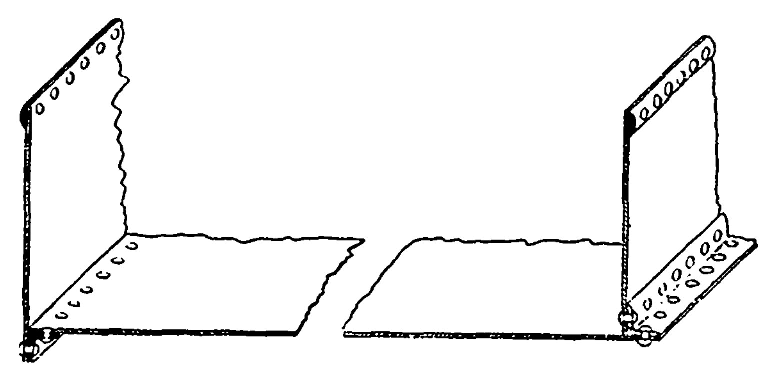
expeditious, and requires less labour than other types. In the present case these tipplers should revolve in thirty seconds, the remaining eighteen seconds being allowed for changing the trams, and contingencies. At first, the rotary side tippler was driven by friction, the power being applied through one of the shafts carrying the friction rollers on which the cheek-rings are mounted; but, except for very light loads, a positive drive by a pinion which gears with a toothed ring attached to one of the cheeks is always employed, as the friction of the rollers against the rings is insufficient to prevent slipping, which speedily wears flat on certain portions of the rings. A most important point is the balancing of the tippler; movable weights should be adjusted until the power required to move the tippler, when containing a loaded tram, is as equal in all parts of the revolution as possible. If well done, the rings once started should almost complete the revolution without external aid, as the centre of gravity of the tippler with an empty tram is considerably lower than when it contains a full one; the coal being a source of energy as it gravitates. At the side of the tippler toward the shute, and sometimes at the opposite side also for

FIG. 5.



balancing and strength, a heavy deadplate of, say, ⅜ inch steel, is provided; its function is to retain the coal until the correct angle for discharge has been obtained, and then guide it gently on to the shute. To prevent the coal falling out over the ends of the tram, the ring on the empty or outgoing side should be sheeted down to just above the level of the top of the empty tram; a wooden buffer is often attached to the lower edge of this sheeting, against which the top load of coal strikes as the tram enters, and thus the tram is stopped in the correct place for the wheels to fit into the slight dishing of the rails which is relied upon for retaining the tram in its correct position during the revolution. At the full end a fixed sheet is of course inadmissable, and a door of some form is usually added. On the whole, the simplest and most easily manipulated door is a plate swung a little below its upper edge on a horizontal hinge; the part above the hinge is heavily weighted, and as the whole door is never allowed to come into a perfectly vertical position, but always with the upper end a little inwards, when unsecured the door at once assumes a horizontal or

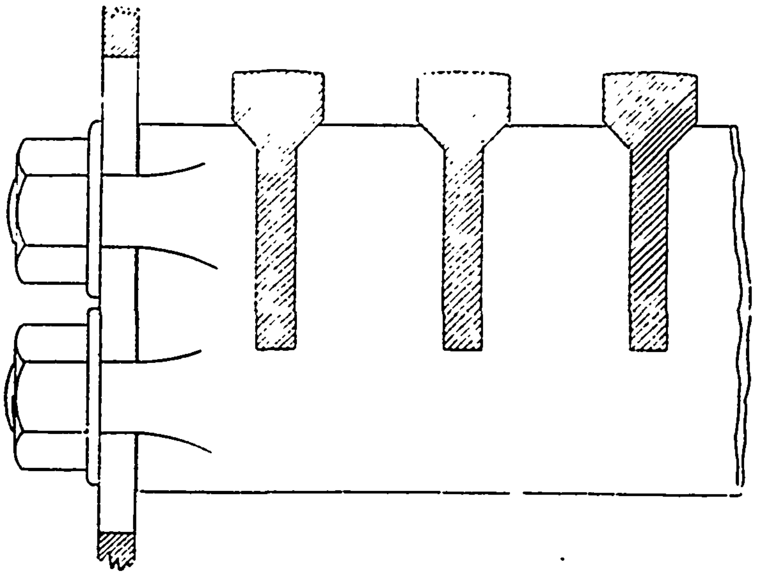
FIG. 6.



open position. All the attendant has to do is to pull down the outer end after a tram has been introduced; a gravity latch secures it until the revolution is almost completed, when the latch falls open, and the tippler as soon as it stops is ready to receive the next tram. The The inverted tram is retained in the tippler by an angle-iron guard fixed just above the wheels. The friction rollers on which the rings revolve should be carried on stiff shafts running right across the tippler framing, and not, as is frequently done, on short overhanging spindles at each side. This form of tippler is not without disadvantages, but a very small portion of the revolution is occupied in the actual discharge of the coal into the shute from the deadplate; a very large part is spent in inverting the full tram, and over half in replacing the empty one. This means that the coal is discharged suddenly and irregularly upon the screen, producing imperfect separation of the "large" and "billy," and necessitating special arrangements for giving a more regular supply to the picking belts. Several attemps have been made to produce a tippler without this defect, by causing it to have a varying speed; probably the best, and certainly the most perfect from a mechanical standpoint is the one described in Mr. Wight's paper before the Institution of Mining Engineers on "Anthracite Breaking Plant"; owing, however, to the great strains set up by the varying velocities of such heavy masses. the tippler needs to be specially designed to withstand such forces.

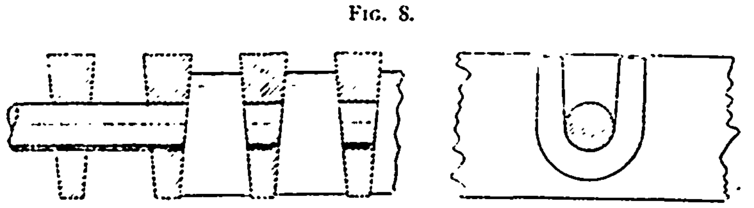
The shute receiving the coal from the tippler, and conducting it to the "collier's screen," is of involute shape, arranged to give a gap of 1 foot 6 inches between it and the edge of the tippler deadplate when the latter begins to discharge the coal; this interval should increase gradually up to about 3 feet when the delivery of the coal is complete. The plate used in the construction of this shute should be of steel, not less than ⅜ inch in thickness, the sides being connected to it by 2⅛-inch angle iron, as in Fig. 6. These side plates should be cut to fit the tippler rings, &c., and have angle-iron brackets riveted on for the support of the shute from the beams of the buliding. Its upper end should extend a little beyond the horizontal centre line of the tippler, and the lower end should terminate at or below the tangent point of the curve of the involute and the angle of inclination of the screen bars. The fixed bar screen which immediately follows, and the cheeks of which may be formed of a continuation of the side plates of the shute, has customarily an effective area of from 75 to 90 square feet, its width must to some extent depend upon the length of the trams, as obviously anything much in excess of this must be ineffective. In the present case we may assume it to be 7 feet in width, and the bars 1½ feet in length, spaced with intervals of 1 inch or 1⅛ inch between them. The section of the bars is a matter of no

FIG. 7.



inconsiderable importance; they should present a fair and even surface to the coal, to avoid unnecessary breakage; they should be strong, to resist vertical deflection, and of such a form that once a piece of coal falls into the space between them it falls with certainty clear through. The section given in Fig. 7 is that which, on the whole, has been found to answer these requirements best; the top surface is slightly convex to prevent the possibility of sharp edges being presented to the coal, and a short distance below it the section is decreased, so that there is very little possibility of pieces wedging themselves between the bars; this disposition of the steel at the same time is about the strongest when the bars are considered as beams supported at both ends. Various methods of supporting the bars are employed; in some cases they rest on angle-iron bearers at their extremities, and three or more rods of, say, 1 inch diameter are passed through holes drilled in the

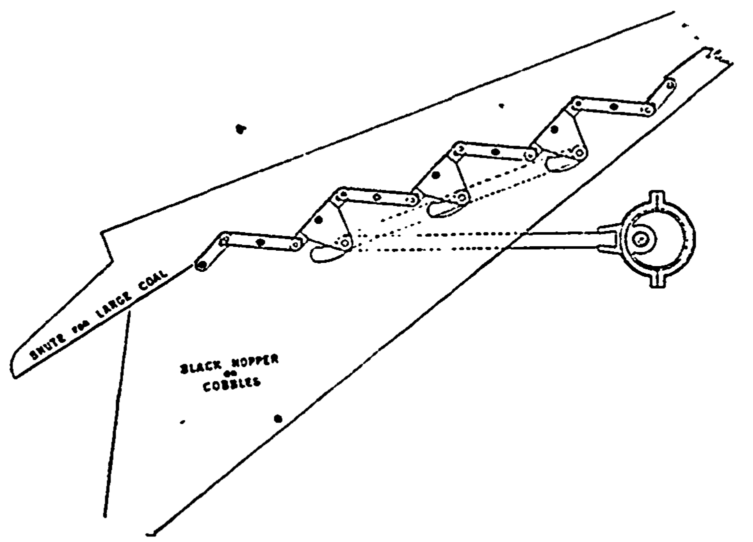
FIG. 8.



bars at intervals in their length (Fig. 8); distance pieces, of cast iron usually, are prepared of the necessary thickness to give the correct spacing, and threaded on the rods between the bars. A more costly but more commendable plan is to support the bars at their extremities, and at one or two intermediate points, in combs slotted out accurately to receive them, as shown in Fig. 7. These, whilst giving the necessary lateral rigidity to the bars, increase the longitudinal strength by providing intermediate points of support, thus admitting the use of a lighter section of bar than is possible when they are supported at the ends only. The inclination of the screen is a matter of prime importance; when polished by use an angle of 22° will be found ample for a hard coal, with not too much small with it, to slide down easily; but, as conditions from time to time vary, and especially as, for some time after starting, the bars will be more or less rough, this angle should be capable of being increased to 25° or 26°. To effect this, the combs, instead of being rigidly attached to the sides, are made to fit into slotted holes, so that the bars can be raised or lowered round their upper ends as a centre; thus the screen is never allowed to be so steep that the coal acquires an undue velocity in passing over it.

The tipping of the trams being an intermittent action, and it being a very desirable, if not an essential condition, that the coal be given an even and regular distribution over the picking band, some appliance becomes necessary for receiving the large coal as it passes off the screen, and delivering it with a fairly uniform flow on the picking belt. Many devices, none of which can be said to be entirely satisfactory, have been tried for this purpose. In some cases a door regulated by hand is applied to the lip of the screen, and the coal fed through it as required by the belt; in others a short belt travelling at about half the speed of the main belt is added; or a short slightly inclined jigging shute is interposed between the screen and the belt. As in the present instance it is proposed to separate "cobbles" from the "large," the double object may be accomplished by combining with the regulating appliance a screen. In Fig. 3 a small jigging screen is shown, fitted with a plate perforated with, say, 3-inch round holes, through which the cobbles pass. (Parenthetically it may be remarked that round holes are found to give better results than square ones.) Instead of this arrangement, a short slow-speed band of woven wire, through the meshes of which the cobbles would pass, might be used; or the coal might be made to travel over a perforated plate by a "push-plate" contrivance. A screen recently introduced, which would appear to lend itself well to this purpose, is shown in Fig. 9. Short bars are

FIG. 9.



given an alternately rising and falling motion, so that the surface has a kind of wave motion imparted to it, which slowly traverses the coal onwards; the cobbles drop through as before. The objection to this appliance would appear to be the number of joints; but a shaking screen is open to considerable criticism by reason of the vibration or shock it sets up, to the detriment of the building and other parts of the plant. Even when, as is sometimes done, two screens are set up to jig in opposite directions at the same time, this vibration still occurs, not perhaps with the same amplitude, but with increased intensity. Suspension by wire or hemp ropes does not prevent the transmission of these shocks; but it is probable that the judicious use of springs applied in the direction of motion of the screen, and perhaps used also to support the screen on, would be the most effective way of diminishing the nuisance. Shaking screens work more efficiently if to the backward and forward motion of the plain shaker is added a lesser upward and downward one; this is readily accomplished by suspending the back end of the screen from the eccentric rods at a little distance from their screen ends, whereby some of the vertical motion of the cranks or eccentrics is incorporated with the horizontal one A very exaggerated example of this device is seen in the Klein screen.

The screens being 7 feet or so in width, and the picking band only from 4 to 5 feet, the lip of the colliers' screen may either be narrowed in from 7 to, say, 4 feet, in which case the jigging screen or other appliance will be of about the same width as the picking bands; or the shaking screen may be made 7 feet wide, and provided with a diminishing lip. In either case the delivering cage of the lip should be dished and cut back at the centre, as shown in Fig. 17; otherwise the coal at the sides will unduly accumulate, as it is made to converge, and will give trouble on the belt.

Should the production of cobbles become at any time undesirable, with the arrangement shown in Fig. 3 all that becomes necessary to cease their separation is the insertion of a blind plate in the shaking screen.

If no special distributing appliance is employed, a very good plan is to set the screen lip at a gradually diminishing inclination; the coal coming from the bars is thus gradually brought to rest, and one of the attendants feeds it as required on to the bands.

In the past the necessity for the use of picking bands has not existed in South Wales to anything like the same extent as in other parts of the country, owing to the very clean nature of the seams; and even now, when the less advantageous beds are being worked, in many instances the picking band as such is a superfluity, and its introduction into the plant only justified on the ground of its being an almost necessary adjunct to the loading gear.

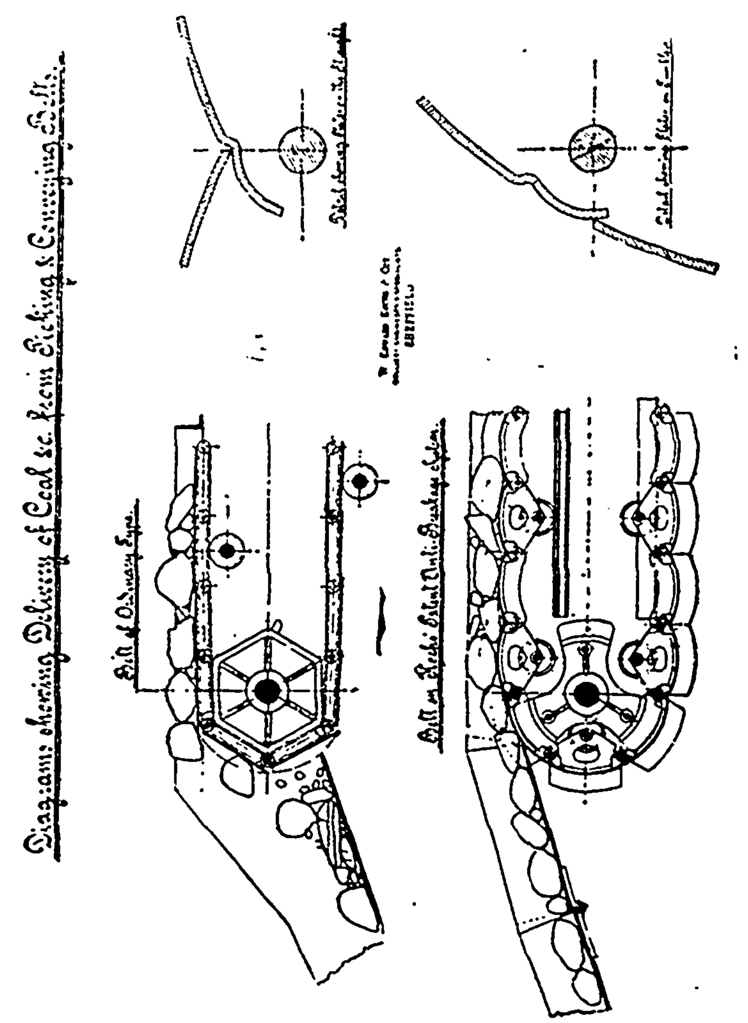
Where dirt has to be removed, a rule is sometimes given for ascertaining the belt area necessary from the percentage the coal contains; but experience shows such a method of arriving at the size of the picking bands to be almost valueless, so much depending upon the nature of the foreign matter, the size of the pieces, and their adherence to the lumps of coal. It is always better to have rather too great a length of belt than the reverse, as dirtier seems may have to be treated by the same plant at a later date. In the case under consideration, the two belts shown in Fig. 3 are of unequal length, one being longer than the other by the distance between the tippler centre lines; in this way, should two seams, one dirtier than the other, be worked, the longer band can be used for the removal of the larger amount of foreign matter.

In width, picking belts may vary from 3 feet to 5 feet; 4 feet 6 inches will be found a very convenient width If picking is to be done from both sides.

There is a great diversity of patterns for picking belts; canvas or indiarubber, woven wire rare used; but for the heavy work of dealing with South Wales coals a steel surface appears to be absolutely necessary, and the heavy loads imposed necessitate special attention being paid to the carrying arrangements.

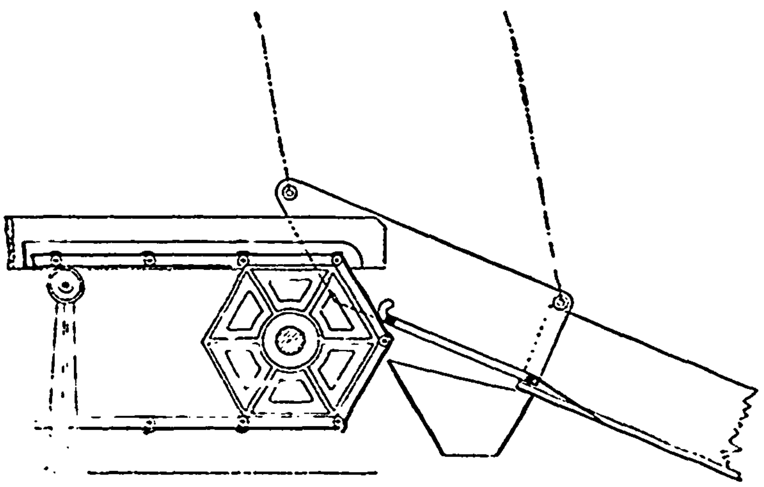
A very important matter is the discharge of the coal from the belt; if any fall is permitted, breakage results, and to some extent the result of perfect screening is vitiated. Hence the attempt sometimes made to make the picking band accomplish the loading into the wagons by forming it with a jib extension; if a separate loading appliance is used, a certain fall appears to be unavoidable as the coal passes off the picking bands. From this standpoint a flexible material such as canvas or indiarubber would be an ideal one, and possibly, if provided with a surface of narrow strips of steel, a very useful belt might be made, the perfect belt would be a continuous pliable steel plate like a band saw, no doubt large terminal drums would be needed if the plate were thick enough to endure heavy wear, but this should be no very great disadvantage. In Koch's belt (Fig. 10), the same object is sought to be attained by the use of separate plates curved to form segments of the end drums, carried upon double link chains and provided with rollers; the curvature

FIG. 10.



given to the plates makes them very stiff transversely, but unfortunately the belt is not so well made that the delivery plate can be applied closely to the nearly cylindrical end, so that if placed high up to prevent any fall of the coal, the smaller particles fall through the gap. If the usual form of belt, composed of flat plates, attached to two or three pitch link chains, according to the width of the belt, is used, the delivery over the end can only be made by setting the receiving plate well below

FIG. 11.

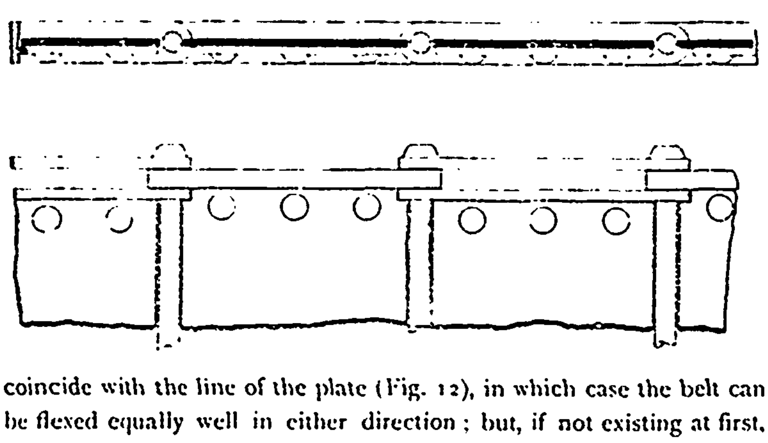


the centre of the drum, on account of the backward and forward motion of any point on the end according as the flats or the angles of the polygonal drums are presented to the receiving shute. To overcome this difficulty, Howe's delivery arrangement (Fig. 11) has been introduced, and it is fairly efficient; the shute is suspended so as always to lie close up to the belt end, and two upturned horns at either side are kept in contact with the plates, and serve to make the shute follow and conform to the motion of the plates. In the figure the shute is shown as a short screen, to remove any fine coal made after the coal leaves the colliers' or cobble screen; this is a refinement occasionally met with, but it is questionable whether it is on the whole an economic one. As usually made, the belt is supported by fixed rollers beneath Fig. 11. In Koch's belt, the rollers are attached to the links and travel with them—a much better plan, as the small amount of power necessary to turn the belt shows. The usual screeching accompaniment to the working of most belts, caused by the edges of the belt rubbing on the side angles, is avoided; and the points of support being fixed relatively to the belt, there is none of the usual irregular up and down motion, and the action is far smoother.

The disposal of the dirt removed at the picking band demands some consideration. In districts where the quantity is much greater than in South Wales, a separate belt, either at the side, above, or below the picking band, is provided, whose function it is to carry the dirt deposited on it to some convenient spot, where it can be run into trams. Occasionally the dirt can be sent at once into trams at a low level, by being conducted from small hoppers beside the pickers by inclined chutes As convenient a plan as any is to have a set of trays, suspended from a light overhead rail, running at the side or over the main belt, on which the dirt is deposited and conveyed to a tip In some instances, where very little rubbish is removed, it is allowed to accumulate for the day on the floor, and removed after coal tipping is finished.

One of the most knotty problems in connection with screening plants is the provision of an apparatus for receiving the coal from the picking bands and delivering it without breakage into the wagons. As already mentioned, in some instances the picking band itself is extended to form a jib end, which can be raised or lowered about the extremity of the horizontal part of the belt as a centre, so that the bottom end follows, as closely as the attendant can make it by means of level reversing clutch gear, the piling up of the coal in the wagon. This plan has two objections. In the first place, the jib end must be long, and cannot be steeply inclined or the coal will roll off it. As a consequence the hinder end of the wagon cannot be properly reached, and when starting to load, the coal has to fall at least the depth of the wagon, as the return belt on the under side has to clear the back end of the truck, and the drum is of necessity of large size, unless the belt is composed of very narrow plates and short links. In the second place, the return belt on the under side has to make an obtuse angle bend at the top of the jib end, and if the plates have a normal amount of lap, they are very liable to be stripped off the links. This latter difficulty may be met by making the links so that the centres of the pins

FIG. 12.



coincide with the line of the plate (Fig. 12), in which case the belt can be flexed equally well in either direction; but, if not existing at first, wear will gradually develop gaps between the plates and the pins, through which small coal may drop and interfere with the working.

A more usual plan is the provision of a separate belt with very short links, so that small drums can be employed, and these are often only four-sided (Fig. 10). This belt may be replaced by a plain shute, in which chains, carrying angle bars between them at invervals, travel, the angles serving to prevent the coal rolling down the belt or shute. Even with these arrangements, however, the hinder end of the wagon cannot be reached, and at the front end some fall for the coal is inevitable. for if steeply inclined the larger pieces of coal will topple over the cross pieces, and if these are made higher to prevent it, they require more room for clearing the wagon on the under side.

(To be Continued.)

THE YMIR GOLD MINES.—The following cable has been received from company's representative at Nelson, British Columbia:—"During the entire month of June, 40 stamps, nine days two hours: total amount crushed, 892 tons (dry weight); bullion, $5,400; concentrates, 52 tons; gross estimated value, $2,400; carbonate ore, $2,900" Office note.—The mill was shut down for 21 days in order to make the connection with the new stamps. Work was resumed with 60 stamps on June 29th, and the remaining 20 stamps are expected daily to start.

CANADIAN GOLD FIELDS Limited.

The Works of the Deloro Gold Mine.

The following particulars of the important mining and reduction plant at Deloro, operated by the Canadian Gold Fields, Limited, was received too late last month to incorporate into the article by Mr. Wells on "Mining in Eastern Ontario":—

Located at the village of Deloro, Hastings County, Ontario, the property comprises Lot 9, 8th Concession of Marmora township, 10 in the 6th, west half of 10 and north-east quarter of 8 in the 9th Concession, in all 525 acres. It is owned and operated by the Canadian Gold Fields, Limited, capitalized at £150,000 in £1 shares, the head office being at 3 Lombard St., London E.C., England.

The mine is under the able superintendence of Mr. T. P. Kirkgaard, mining engineer, assisted by Mr. S. B. Wright, metallurgist, Mr. A. H. Brown, assayer and Mr. Geo. McQueen, head accountant.

The ore is a white quartz with arsenical pyrites, dolomite or bitter spar, and a little mica. It is said to assay $10.00 to $13.00 per ton of ore as gold values.

The mispickel in the quartz is generally fine grained and compact but large striated silver-white prismatic crystals are also found.

The vein at the deepest level, 440 feet down, averages 5¾ feet in width and is well defined being at the contact of talcose schists with granite. It runs directly north and south with a dip of 30° to the west.

The vein has a dyke of diorite crossing it which is characteristic of the auriferous quartz veins of the district The ore is being won by 10 air-compressor drills and raised by skipway following the vein.

The workings are at present confined to one shaft, drifting being done on both sides, although there are three shafts down at various points along the vein.

The air-compressor plant is in admirable condition, being housed in a substantial brick building. It is run by a Corlis compound engine, 200 h.p., made by the Canadian Rand Drill Co. of Sherbrooke, Quebec, and supplies power to the drills, hoists and pumps.

Steam is made by four 100 h.p. boilers, hard wood being used as fuel.

A double-drum hoisting engine carries ore by tram-car from the mouth of the shaft to the top of the mill, from which point it is passed on by gravity to grizzlies, Blake crusher, Challenge automatic feeder, and to a 10 stamp battery of Fraser & Chalmers pattern.

The crushed ore at 30 mesh passes over amalgam plates to five Frue vanners, the tailings going into the river adjacent, while the concentrates consisting of arsenical pyrites, silica, pyrite, mica, are passed by gravity to the leaching plant below. The machinery in the mills is run by a 75 h p compound condensing Robb-Armstrong engine.

The leaching plant consists of three large storage tanks for holding weak solutions of bromo-cyanide, three large leaching vats 16 feet in diameter for holding concentrates, the dissolving solution being forced in from below. After the liquor has percolated through the concentrates for 24 hours or more it is drawn off through a system of iron cones in which zinc fume is placed to precipitate gold from the bromo-cyanide solution. The resulting zinc-gold mud is roasted in bullion room to free from zinc and the gold melted into bars.

The bromo-cyanide process Sulman-Teed patent) used seems to be a modification of ordinary cyanide formed by the addition of one of the haloid compounds of cyanogen. The bromide of cyanogen is used because it is cheap, easily transported being a white crystalline solid at ordinary temperatures, and is a ready solvent of gold. Its chief merit depends on its quick solution of fine gold disseminated either in quartz or arsenical, antimonial or other compounds. The success of the process no doubt depends on the skill and intelligence of the metallurgist as different ores require different treatment.

The mine has a well equipped repairing machine shop in connection, the superintendant being an experienced mechanical as well as mining engineer, which no doubt accounts for all the handling of ores, etc., being automatic and thereby cheaper.

The arsenic refining plant erected several years ago by R. P. Rothwell M E. of New York city *et al*, has been overhauled and is now treating the concentrates from the leaching vats for the contained arsenic.

The plant consists of a large revolving cylindrical dryer, calciner of revolving cylinder type, the fumes of As_2O_3 mixed with SiO_2, lime, Fe_2O_3, etc, arising from calciner are caught in 20 condensing chambers in a row.

The crude white arsenic is then transferred to a refining furnace built on style of a reverbatory, the fumes being caught in 10 condensing chambers.

The refined white arsenic is then placed in automatic filler, transferring the product to barrels holding 400 lbs. each. The refined white arsenic which runs 99.4-99.8% As_2O_3, is better than English or German grades and finds a ready sale in New York City and elsewhere at an average price of $70.00 per ton. The output averages about 30 tons per month.

As white arsenic is a poisonous compound every precaution is taken by the superintendent, assisted by the foreman of the arsenic works, Mr. Chas. Tildon, to guard the health of workmen.

The workmen have a changing room, bath room supplied with hot and cold shower and tub baths, and are compelled to change complete apparel with a bath at end of each shift. Negligence of instructions resulting in dismissal.

The antidote for arsenic poisoning, freshly made ferric hyroxid, is always ready in case of emergency.

The workmen are obliged to wear nose sponges, to protect membranes of nose and throat.

In fact the attention shown to the workmen by the superintendent only illustrates the admirable management of the mine, mill, concentration and leaching plants, etc., as a whole.

CANADA IRON FURNACE.

NEW PLANT AT MIDLAND, ONT.

The Canada Iron Furnace Company's new blast furnace plant at Midland, Ont., is situated on the shore of Midland Bay, immediately opposite the town, with a perfectly sheltered harbor, safe at all seasons of the year. The property upon which the furnace is built is about 100 acres in extent, with a splendid water front on the bay, the works being erected in immediate proximity to the water. The furnace water front will be available for vessels of large size, and will be about 450 feet long, with a depth of water alongside (when dredging operations now in progress are completed) of 21 feet 6 inches. The wood wharf in front of the charcoal kilns will have a length of from 800 to 1,200 feet. The docks will be fitted with Brown elevators of modern type that will unload the ore and other necessary material from the vessels and deliver directly into the stockhouse.

Furnace.—The furnace is 65 ft. x 12 ft., and capable of producing from 100 to 150 gross tons of iron per day. The furnace, with hoist, water jackets, and all fittings, is modern in every respect.

Hot Blast Stoves.—There are three stoves, 16 ft. diameter x 65 ft. high, known as two-pass stoves. They are first class in every respect, including fittings, the whole resting upon a large and substantial stone foundation, laid in cement.

Furnace Cast House.—40 ft. wide x 150 ft. long, the floor of which is 5 ft. above yard level. Walls entirely of brick (heavily built) 20 ft. high, with roof of steel.

Steam Hoist.—The usual crane pattern elevator engine.

Boilers.—Eight 50 h. p. flue boilers supply steam for all requirements.

Boiler House.—Consists of iron columns, with steel roof. Between columns is built in with brick work, and boiler house is erected immediately adjoining the engine room, so that the engineer on duty can at all times have two boilers under his eye.

Engine House.—Brick structure, with fireproof roofing. Building is provided with steel I beams for the purpose of handling any portion of the engines or machinery situated in the building.

Blowing Engines.—Made by the Ragor Machine Co., of Columbus, Ohio, are first class in every respect, each one being capable of supplying in itself sufficient blast to the furnace. They are thoroughly well finished and fitted out with all requirements, including patent water heaters for boiler feed.

Pumps.—There are two large duplex pumps for circulation and fire purposes. One duplex for boiler feed purposes. All pumps are more than ample for requirements.

Chimney.—Is built of steel 10 ft. diameter, 170 ft. high. The foundation is built of stone 20 ft. high, and is exceptionally strong. Chimney is first class in every respect, and is lined with firebrick. Inside diameter, 8 ft. 6 in.

Workshop.—A brick building 30 ft. x 60 ft. One end contains blacksmith's shop, separated from the machine and carpenter shops by an 8 in. brick partition wall. In the blacksmith shop is situated a locomotive-type boiler, with engine attached, for the purpose of providing power for the shops, also for heating same in winter if furnace should be shut down. The remainder of building will be used for machine shop and carpenter shop, and in the latter is situated necessary wood-working machines, such as saw table, jig saw, and buzz planer. Machine shop is also equipped with the usual tools required for furnace use, such as pipe cutting and screwing machines, lathe and drilling machines, iron sawing machines for cutting samples, etc.

Office.—Is situated immediately above the works on the hill-top, where a complete view can be had of the total plant. In this building are situated all the offices, as well as chemical laboratory, etc.

Water Tank.—Steel tank 12 ft. diameter, 40 ft. high, situated immediately above the office on the highest point of the adjacent hill and about 70 feet above the water level. The present intention is to pump all water for requirements to this tank, and supply furnace and buildings generally directly from the tank, the total water supply for plant being taken from the bay immediately in front of the works.

Charcoal Kilns.—Consist of 65 cord kilns, and are built in a double row, parallel and in close proximity to the water front. Each kiln is built on a solid stone foundation. Between two rows of kilns will run a wooden trestle, with railway, for the purpose of delivering loaded cars to the kilns.

Scales.—The yard is provided with modern railway scales, of full capacity. Stock-house is equipped with the usual six beam scale.

Stock Shed for Ore.—This building is about 80 ft. x 200 ft., and is provided with trestle-work for railway cars, also an overhanging roof facing water front for the purpose of permitting the Brown elevator to deliver ore underneath the roof. The foundation is of stone, with suitable superstructure.

Railway.—The Company's railway, which connects with the line of the Grand Trunk Railway at the edge of the furnace property, extends from one end of same to the other, and is owned and controlled by the company.

Midland as a location for the furnace is unsurpassed, being in very close touch, by direct water route, with the iron mines of Lake Superior, and the furnace can draw its supplies with equal facility from either the Canadian or American mines. Vessels plying from Lake Superior to Midland can do almost double service, as compared with boats plying to Lake Erie and Lake Ontario ports. Midland is also splendidly situated for serving the Ontario and Eastern markets with iron products. The following table will show how well placed Midland is (in comparison with other Georgian Bay ports) with regard to serving Eastern points:—

Distance from Midland to Montreal via Grand Trunk Railway, 383 miles.
Distance from Owen Sound to Montreal by Canadian Pacific Railway, 460 miles.

MIOCENE GRAVEL.

Mr. R. H. Campbell, manager of the Miocene Gravel Mining Co. of Cariboo, Limited, sends us the following particulars of the important work going on at this property in the Harper Camp, Cariboo, B.C.:—

The shaft sunk in 1897-8 to a depth of 400 feet proved to be on the north rim of the channel, the rock pitching at the rate of 30 deg. The gravel at this depth was found to be a very uniform wash, composed principally of quartz, containing fine gold from top to bottom, with coarser gold on the pitch of the rim.

The depth of the channel proved a surprise. Our plant and the size of this shaft, a two compartment of 4 x 4 each, being entirely too small for this great depth, it was decided to enlarge the plant and sink a new three compartment working shaft, nearer the centre of the channel. A site was selected about 1500 feet from the old shaft, and during the winter of '98 and '99 the shaft house, 100 ft. by 65 feet, was erected, with a gallows frame 40 ft. high, and the sinking of the three compartment shaft, 4 x 5 each, begun.

In October, 1899, at a depth of 490 feet, all in ancient channel gravel, the bedrock was reached, and found to be still dipping at an angle of about 15 deg. The gravel in this shaft was found to be similar to that in old shaft, and prospected better and more regularly, though not in paying quantities, nor do we expect it in paying quantities until the bottom of the main channel is reached. The shaft is now being sunk in the bedrock, and at 550 feet we intend to drive off for the channel hoping to catch the bottom. We expect to reach it some time next month (July).

In sinking this shaft, large quantities of water were encountered, first flow being at 110 foot level, where a loose stratum of gravel was encountered, which gave us a flow of 400 gals. per minute. We cut out a station at the 140 foot level, caught up the water and pumped from this point to the surface, using a Special Duplex Knowles Steam Pump with a capacity of 400 gals. per minute.

We then continued sinking without any further increase of water until the 200 foot level was reached, where we had an increase of 300 gals. per min. In the meantime, the water at the 140 foot station had diminished about 75 per cent., leaving us about 400 gals. per minute in all to handle.

At this point two large Knowles sinking pumps, with a capacity of 400 gals. each per minute, weighing two and a half tons each were placed in the shaft, and sinking resumed until we reached the 250 foot level, where a 12 x 16 foot station was cut out, in which large tanks were built, the water all caught up and turned into them.

shaft considerable increase of water was encountered at times, but the water in the upper portion of the shaft diminished in about the same proportion until bedrock was reached. A few sandstreaks were encountered, which at first gave considerable ncrease of water, but when bedrock was reached, the water began to grow less.

Notwithstanding, work was suspended for four months during last winter and the shaft standing full of water until unwatered one month ago, we now have less than 300 gals. per minute, and it is diminishing daily.

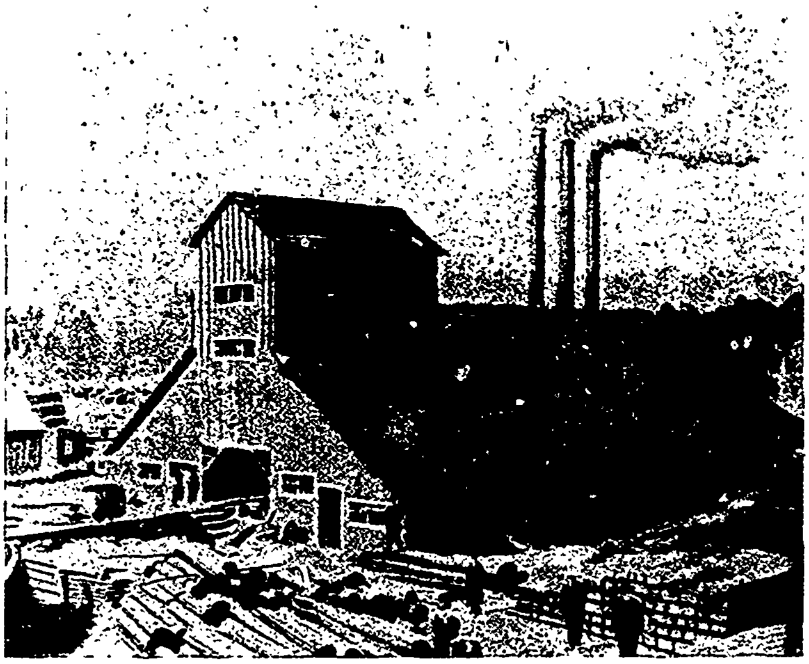
The plant now consists of a shaft house 70 x 100 feet, four Standard boilers, aggregating 225 horse power, a steam hoist, four sinking pumps, four station pumps, electric lighting plant, which lights the shaft and works, and a sawmill for cutting lumber and timbers.

The shaft is timbered with 8 x 8 sawn square sets and lagged tight with 2-inch sawn lagging, all from excellent fir timber from surface to bedrock. In bedrock, 10 x 10 sawn square sets are being used on account of the swelling nature of the rock.

The total outlay to date has been $150,000 We expect to determine the value of the property within the next two or three months.

Indications are all that we could wish, but the channel being so much larger and deeper than first anticipated, it has taken a great deal more time and money than we at first expected.

However, we do not look upon this as a bad feature, and we expect to find the bottom pay stratum correspondingly lager.



SURFACE PLANT MIOCENE GRAVEL CO. AT HARPER CAMP, CARIBOO, B.C.

At this station, two large Worthington compound steam pumps, with a capacity of 500 gals. per minute each, weighing about 8000 lbs. each, were placed. One of these pumps handled all the water (which varied from 450 to 600 gals. per minute) from the station to the surface through an eight inch water column. The other pump was kept in readiness as an auxiliary to relieve the other in case of needed repairs.

Sinking was then resumed, the two large sinking pumps being used to pump the water from the bottom up to the 250 ft. station. In sinking this lower section of the

If the entire deposit could be worked by the hydraulic process, it would be the largest proposition of that kind in existence, but unfortunately one, and only one, of the principal requisites necessary for hydraulicing is absent, viz., the dump or outlet for the disposition of the washed material. The enormous deposit containing sufficient gold, its susceptibility for hydraulicing and the abundance of water at hand, make the conditions extraordinarily favorable for hydraulicing if an outlet could be had. As it is, it must be a drift mine if anything.

MONTREAL-LONDON.

TRANSFER OF THE DUFFERIN MINE TO AN ENGLISH SYNDICATE.

The following particulars of the agreement made between the Montreal-London Gold and Silver Dev. Co., Limited, and James G. Miller, of Glenlee, Kircudbrightshire, Scotland, transferring the well known Dufferin Gold Mine at Salmon River, Halifax County, Nova Scotia, will be of interest :—

1. The works of the company at their Dufferin and Lake Eagle Mines, in Nova Scotia, shall be run for thirty days from the fifteenth instant under the control and supervision of L. W. Getchell, Esq., mining engineer, as representing the said Miller, in order that the latter may have an opportunity of making mill tests of the values of the ores in sight in said mines, the works to run during said thirty days to the best advantage of the company and the said Miller to pay the salary and expenses of said Getchell.

2. At the expiration of said term of thirty days, the company shall give said Miller an option to purchase the said mines at any time during an additional term of two years on the following conditions, namely:

a. The purchase price to be one million two hundred and fifty thousand dollars, one million whereof payable in cash and the balance in unassessable shares of a company to be formed by said Miller for the purchase and operation of said mines.

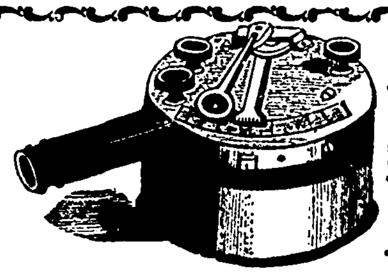
b. The said Miller shall forthwith supply and erect at said mines, at his own expense, machinery at a minimum cost of twenty-five thousand dollars for the purpose of treating the concentrates and other purposes, such machinery to remain on the property whether the option is exercised or not.

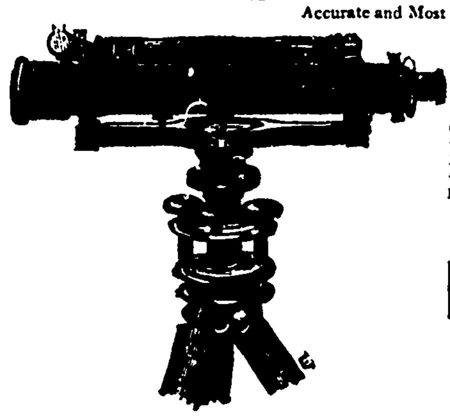
c. The said Miller shall pay to the company during the said term of two years by way of rental for said mines ten per cent. per annum on one million dollars payable monthly, such rental to commence to run only from date of installation of said machinery, the delay to instal the same not to extend beyond three months from expiration of said thirty days.

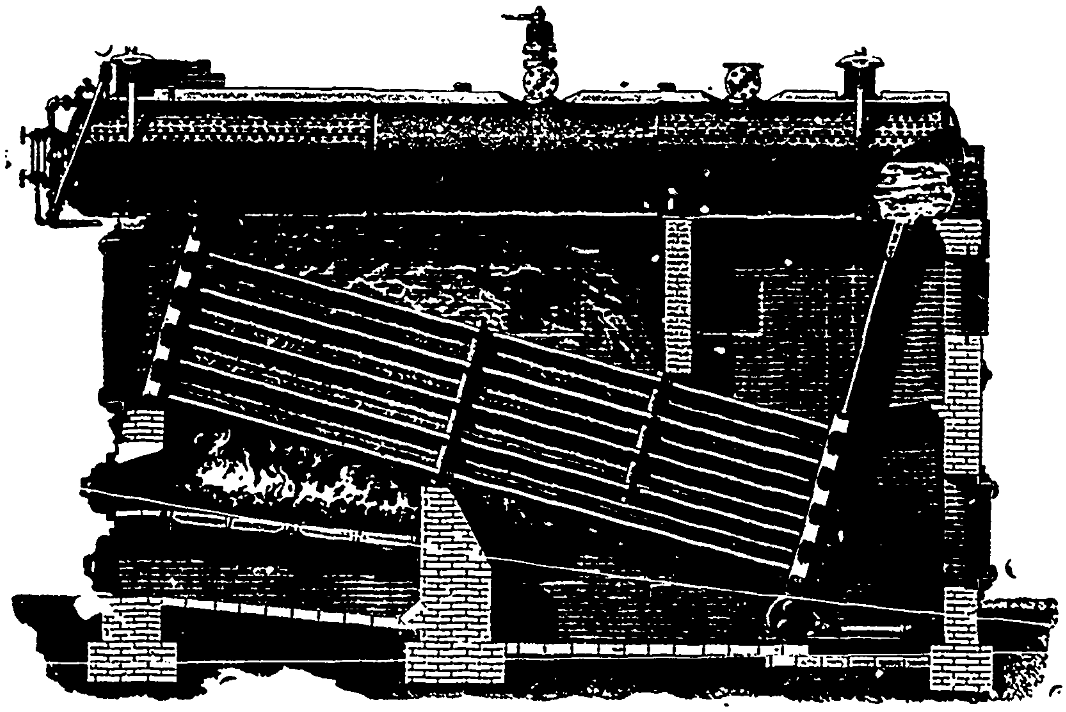
d. Pending the exercise of said option, the said Miller shall at his own expense work the said mines in a proper and skilful manner, to the satisfaction of the company's engineer for the time being, and all net profits over and above expenses including the ten per cent. above mentioned shall be forthwith paid to said company as part payment of said purchase price if option be exercised, or as additional rental if said option is not exercised.

e. Pending the exercise of said option, the company shall have the appointment of the accountant to be kept at the mine, said accountant to be satisfactory to said Miller. The company to have also, at all times, access to all books and accounts.

3. The performance of all the above obligations of said Miller at the time herein specified for the fulfilment thereof shall be considered as being of the essence of these presents, and the failure to perform any thereof as aforesaid shall *ipso facto* deprive said Miller of all rights hereunder and entitle the company forthwith and without legal process to resume possession of said mines.







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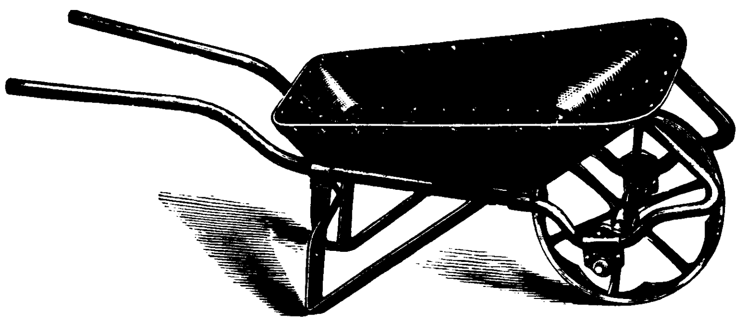
Mining and Mill Supplies

PATENTED MINING BARROWS.



Our Patented Mining Barrows are made to dump forward, and at the dumping point readily discharge their load, thereby avoiding the strain incident to side dumping Barrows.

The Frames of these Barrows are so constructed that at the dumping point they are prevented from running back on the operator.

These Barrows will stand on end, thereby saving room in storage.

No. 4	Width of Tray, 29 in. Length of Tray, 32 in. Capacity, 3 cubic feet earth. 16 in. wheel. Tray No. 16—Steel. Price - - - -	**$11.50**
No. 4½	Size and capacity same as No. 4. Tray No. 14—Steel. Price - - - - - - - - - - - - -	**$12.25**
No. 5	Width of Tray, 31½ in. Length of Tray, 36 in. Capacity, 4 cubic feet of earth. 16 in. wheel. Tray No. 14—Steel. Price - -	**$14.25**

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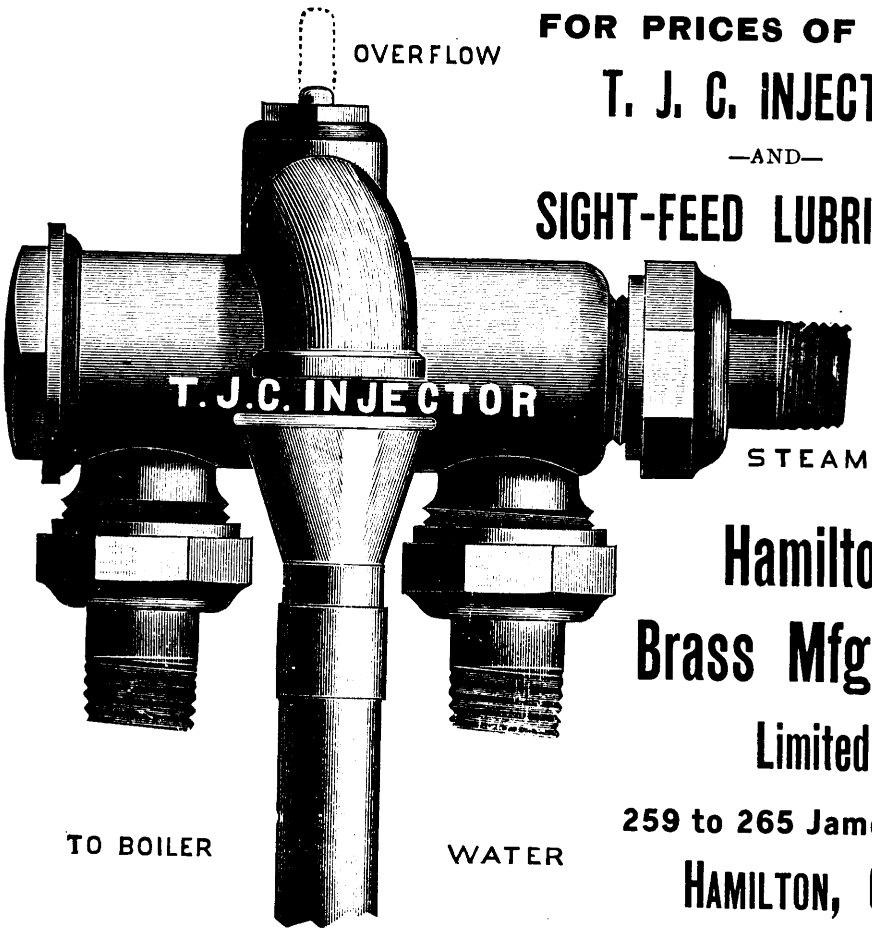
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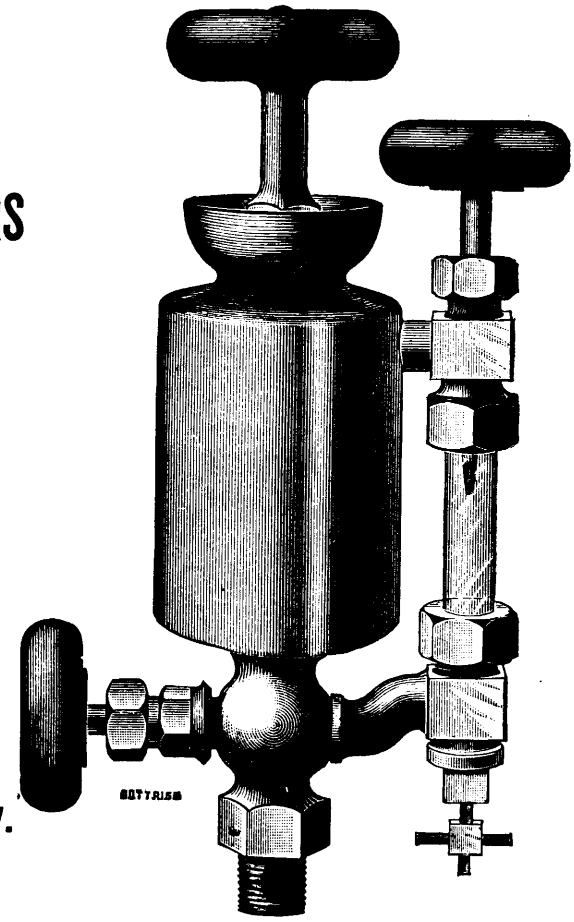

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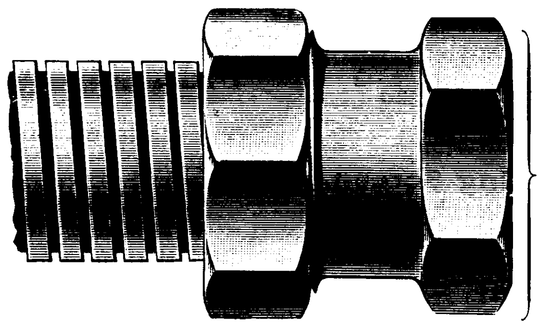
THIS Hose is made entirely of metal; there is NO rubber in connection with it. It will therefore stand ANY pressure of steam. It is at the same time as flexible as rubber steam hose, and with proper care it will last many years.

This Hose is made in sizes from ¼ inch to 8 inches inclusive, and can be made to stand 2,000 (two thousand) pounds pressure to the square inch.

This Hose can be readily connected to Iron Pipe.



Screwed for Standard Iron Pipe Thread.

We supply for this Hose the usual Rock Drill Hose Connections, or any other special connections which may be required.

We have just introduced this Hose in this conntry, and miners who have seen it are taking to it like a mouse to cheese.

Write to us for catalogue and particulars.

We carry stock to 2½ inches diameter, and can import larger sizes.

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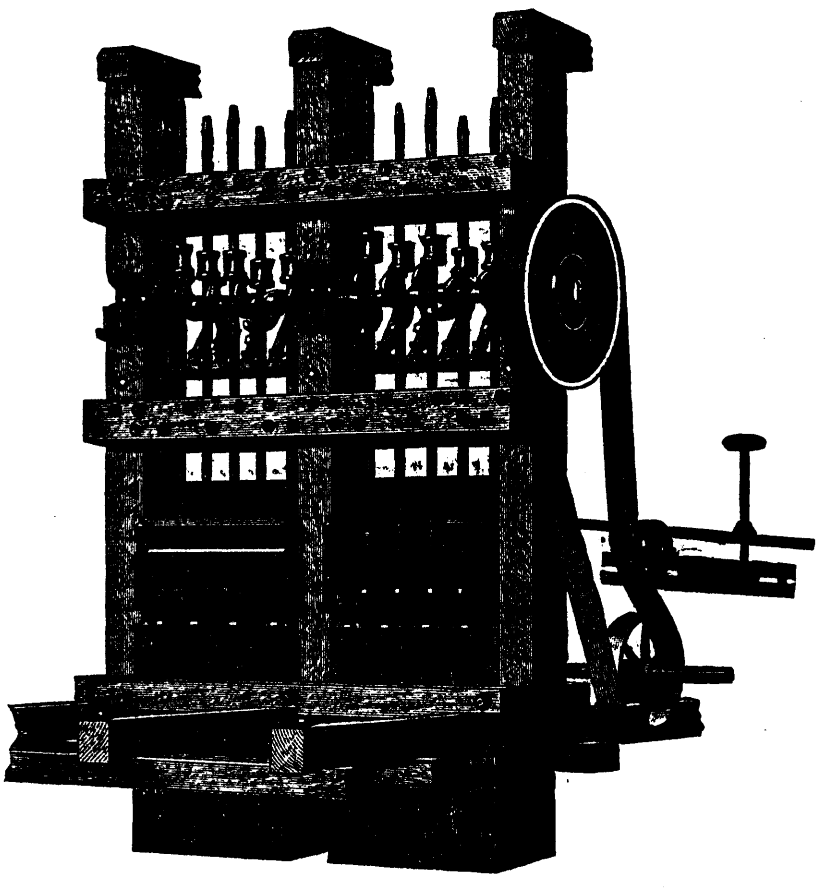

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