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Canadian

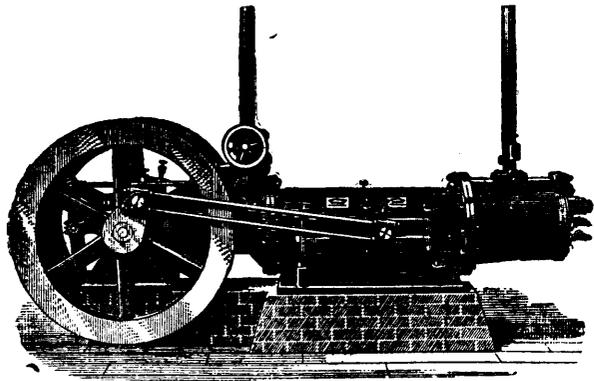
Established 1882

Vol. XV.—No 8

MONTREAL—OTTAWA—HALIFAX.

AUGUST, 1896.

CANADIAN RAND DRILL CO. MONTREAL, QUE.

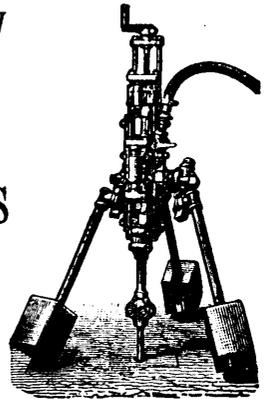


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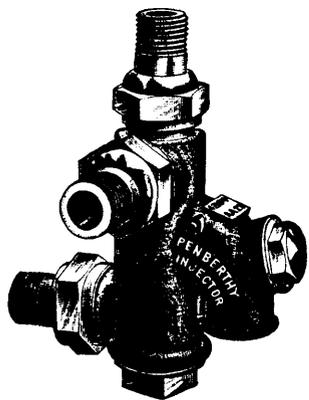
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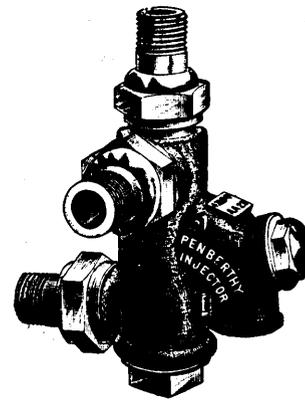
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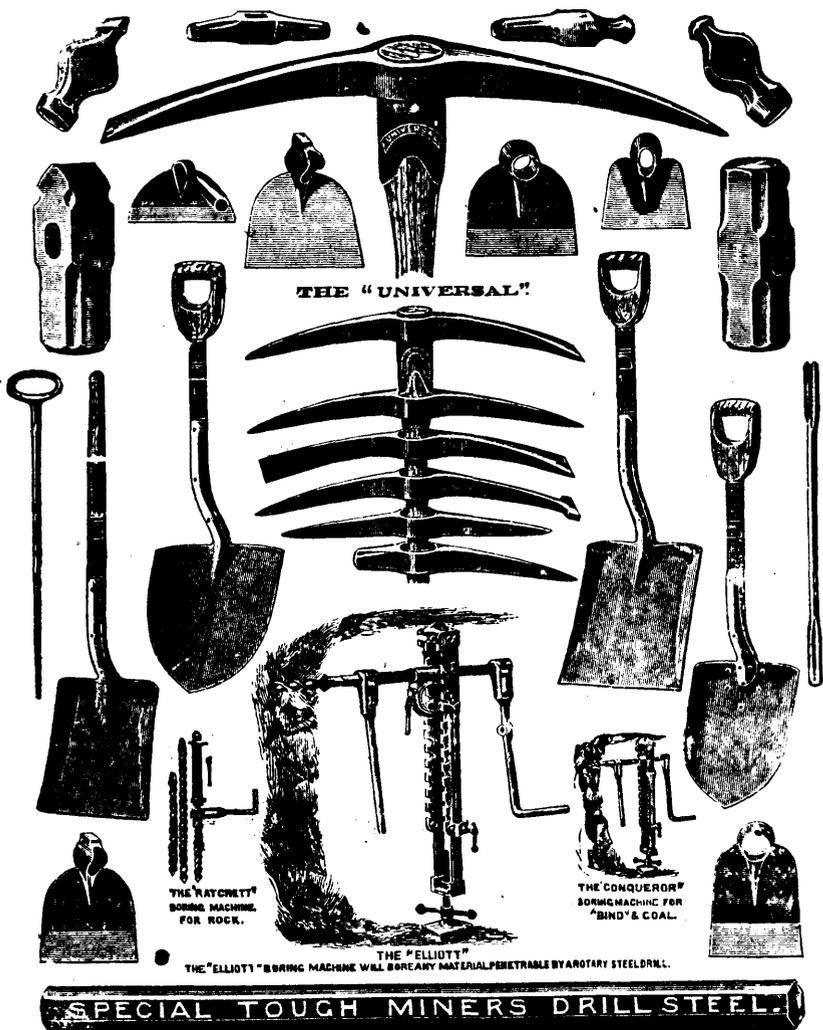
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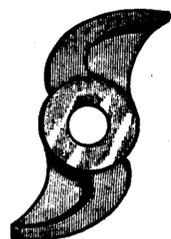
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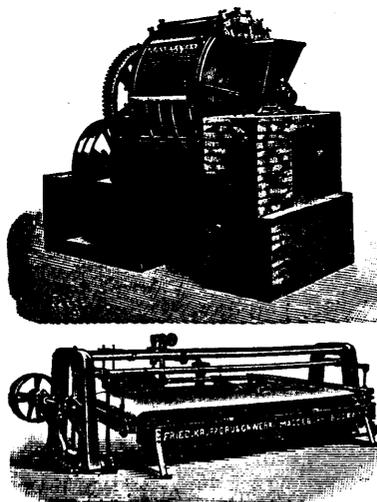
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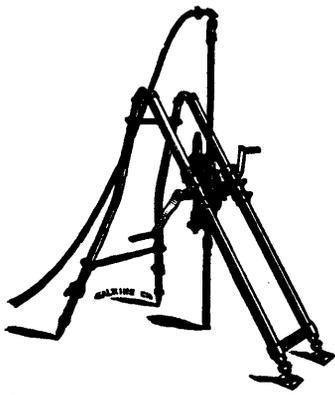
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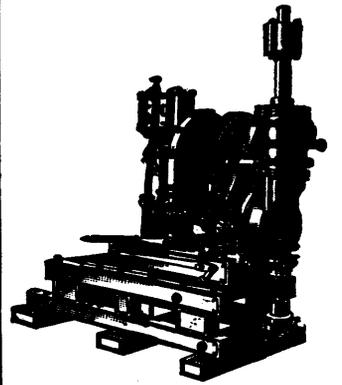
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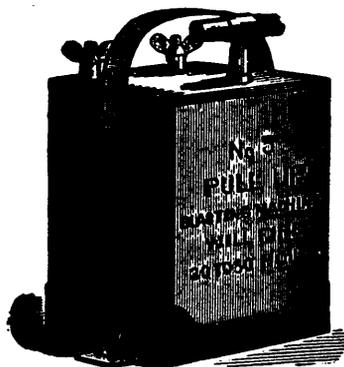
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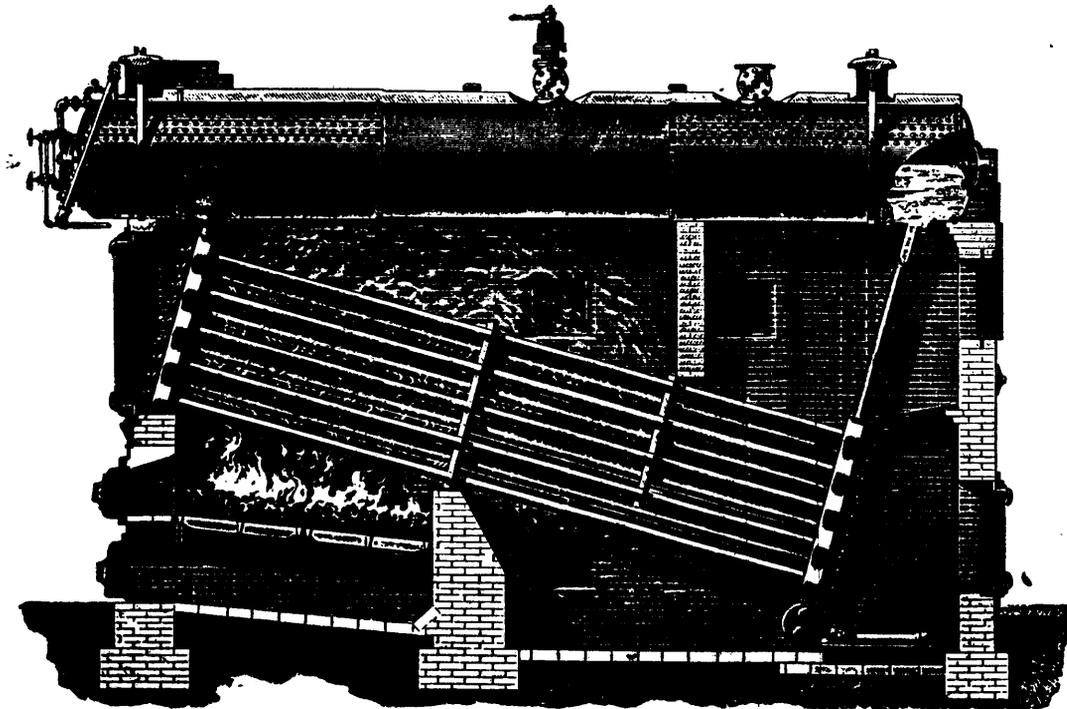
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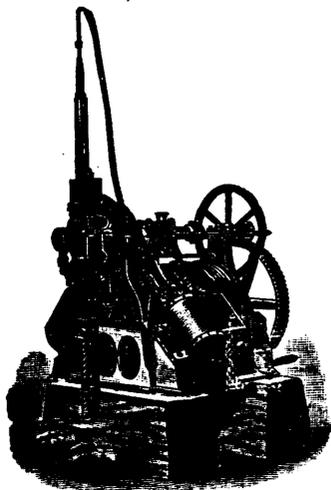
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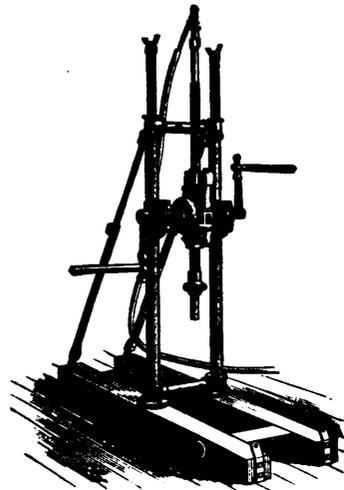
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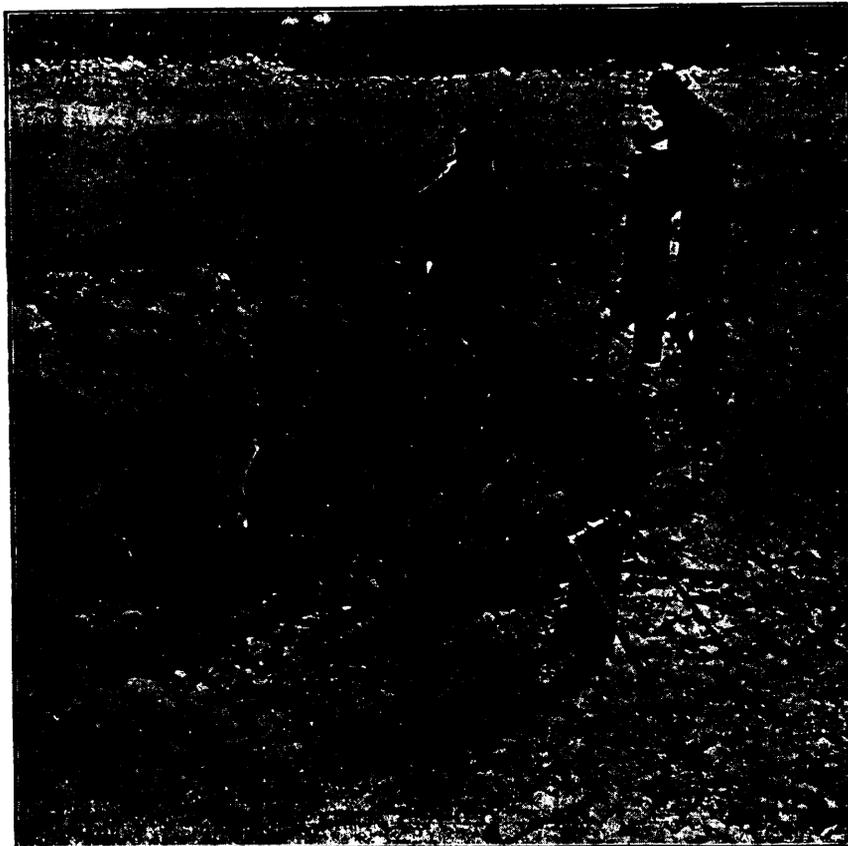
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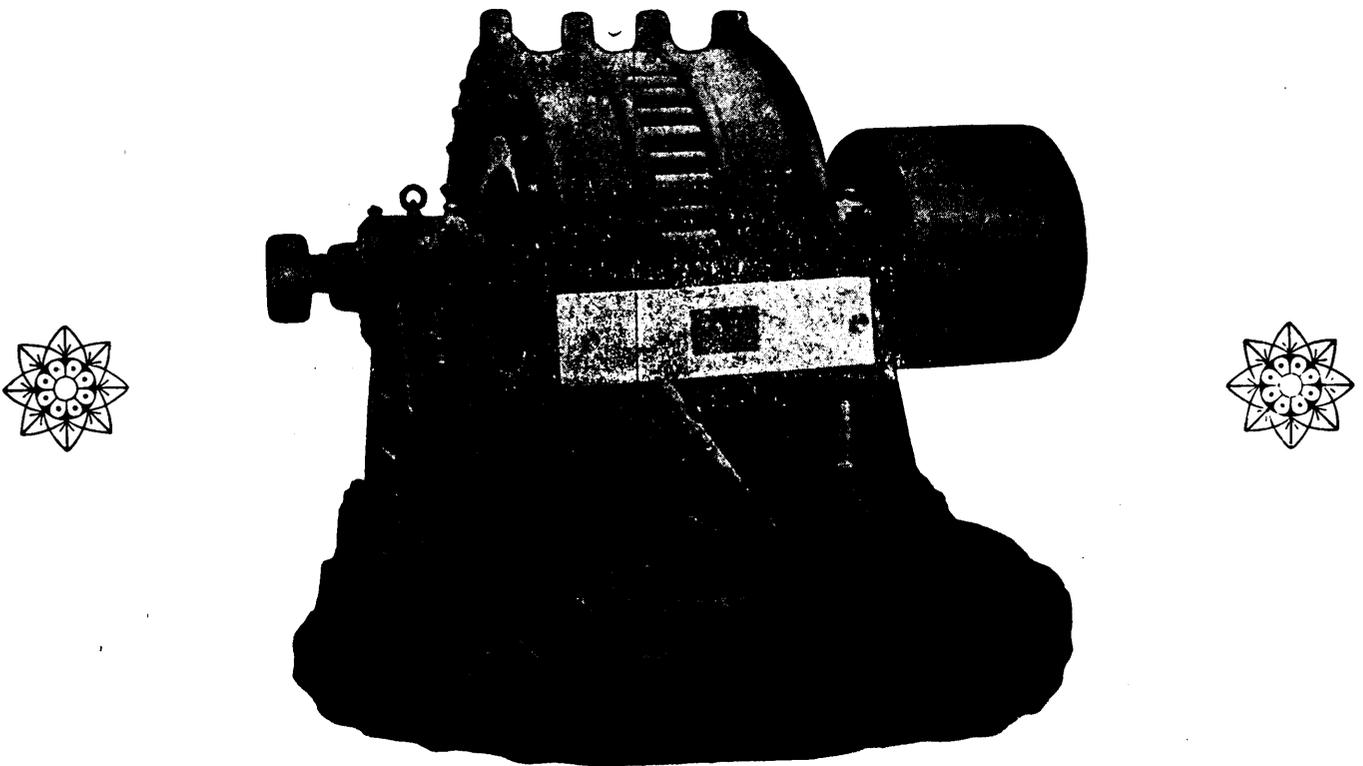
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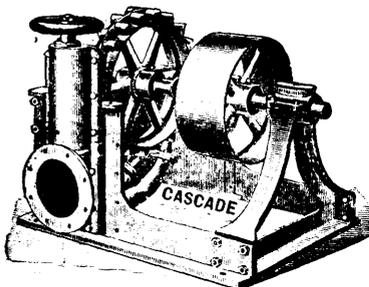
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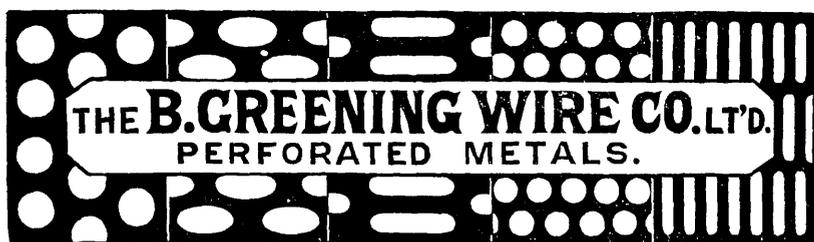
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All mining men cordially invited.

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Claims range from 10 to 20 acres on vein or lode.

Locations may be acquired in fee or under leasehold.

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Original discoverer of ore or mineral on claim entitled to stake out a second claim.

Crown Lands sold under provisions of mining laws in force prior to 4th May, 1891, exempt from royalty.

Copies of the Mines Act, 1892, Amendment Act, 1894, may be had on application to

ARCHIBALD BLUE,

Director Bureau of Mines

TORONTO, May 25th, 1894.

JUST ISSUED.

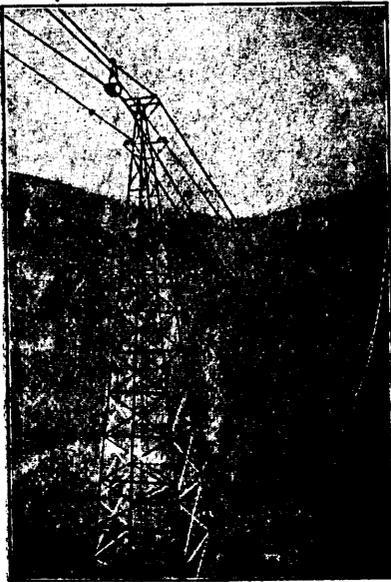
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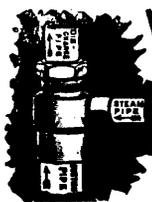
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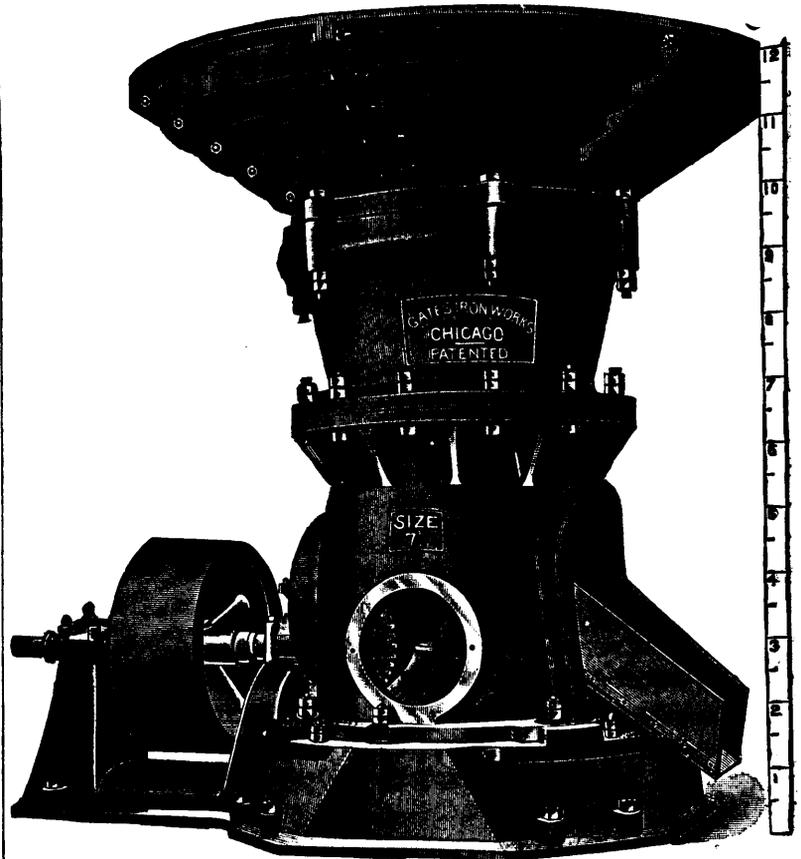
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VOL. XV., No. 8

AUGUST, 1896.

VOL. XV., No. 8

Quackery in Mining Education.

We are very pleased to give space to a letter from Prof. Edgar Kidwell, of the Michigan Mining School, which gives in greater detail than his original article in *The Engineering Magazine* his views upon the question of permitting professors in technical schools to conduct an outside practice. In our June issue we disagreed with Prof. Kidwell's expressed opinion, but we are bound to admit that in his amplified statement he occupies a much more tenable position, and we do not hesitate to heartily endorse his proposition that, "Until a school is able to command the services of a competent man to direct a course, it had better let that course alone, and confine itself to work which it can really do well."

The difficulty arising from this standpoint, however, would be that a strict enforcement would result in having no instruction given in mining at all (we speak, of course, of Canada), for we unhesitatingly say that none of the technical institutions in Canada, offering mining and metallurgical instruction, pay anything like a reasonable compensation for the services of a competent engineer; even the recent endowment of McGill's chair of mining and metallurgy with \$50,000 will, we are informed, yield a salary of only \$2,000 or \$2,500, which it is not proposed to supplement out of other funds.

What competent engineer will give the whole of his time and services for eight to nine months every year for such a sum? There are plenty of inferior men acting as superintendents for a much higher wage.

If, therefore, it be a question between procuring the partial services of a first-class man, or the entire services of an inferior man, we must adhere to our opinion that the former is better for the school than the latter. For we think the implied inference of Prof. Kidwell's letter that such a first-class man would neglect his duties as a professor and regard students "as a necessary evil" is unjust to the profession, and is not warranted by one or two cases which may have come under his observation.

That there is a superabundance of half fledged material, men whom Prof. Kidwell describes as "whose intentions go no further than to make out of the office every dollar they can," who have been failures in practice, whose experience has been limited, and who eagerly embrace such an opportunity for half a livelihood as a professorship offers, is but too true.

Were our educational institutions liberally endowed there might be no necessity to depend on such material, but facts exist, and small salaries are not tempting to the successful engineer.

From both the educational and moral points of view we cannot think the entire services of such men equal to the partial services of one who is an authority, who knows and has experience of that which he teaches, who is in touch with and is one with his fellow-engineers in the making of mining and metallurgical history.

Could Prof. Kidwell's ideal conditions of liberal endowment and reformed trustees or governing boards be realized we could unreservedly

endorse his propositions; until that time we believe that the interests of the schools would not be injured, as a whole, by permitting to the professor such outside professional work as did not interfere with the amount and quality of the instruction given to the student.

Until such time arrives we shall continue to see governing boards swayed by the prejudices or limitations of one or two dominant minds, and with the mistaken idea of economy offering penurious stipends to men whose experience lies in books and labelling specimens, and in the successful use of printers' ink to announce their compilations as marvels of originality and research, and who as teachers will teach far less than the man accustomed to deal with facts.

The following is Prof. Kidwell's letter:—

"In your June issue, under caption of 'Quackery in Mining Education,' you state: 'The last element of quackery mentioned is that no teacher should be permitted to continue his engineering practice outside of his college duties. In this we do not hesitate to entirely disagree with Prof. Kidwell. Not only is it true that the vast majority of schools cannot afford to pay for the exclusive right to a competent man's services, but it is equally true that a man who is not in touch with the latest work in his profession, is unfit to teach that profession.'

"The space at disposal in the original article was too limited to permit a full discussion of this question, but the following extract from the first draft of that paper will make clear my position in the matter:—

"Over and over again we hear the question, shall professors in technical schools be allowed to do outside work? I maintain that they not only should, but must, if they are to keep up with the times. A professor forbidden to do any such work loses interest, becomes fossilized, and after a few years he is no more fit to teach engineering than an old sea captain is fit to command a modern steamer. But it is highly important to distinguish between the *kind of work he ought to do, and what he must avoid*. My own experience and observation lead me to believe that no professor should be allowed to do any kind of outside work other than that which has for its object the improving of his teaching, either by enlarging his sphere of experience, or providing him means to illustrate, better than can be done in any other way, the work of his class-room. Any attempt to carry on a general outside practice to make money, or to advertise the school, or boom himself, should be promptly frustrated, since such work is entirely outside of the purpose for which a technical school is established. To allow it is to put in a professor's way a temptation to neglect his department; it also attracts as candidates for professorships a class of men whose intentions go no farther than to make out of the office every dollar they can, regardless of the injury they inflict upon others.

"Such men look upon students merely as a necessary evil,—beings who must be tolerated in order to hold a position, but who must not be permitted to interfere with their outside work, popular lectures for show purposes, making of tests of no scientific or educational value in order to earn money or impress the public, etc.

"There is but one way to prevent such evils. Men of sterling honesty must be put in charge of the work, and be paid what their services are worth. They can then devote all their time to producing educational results, instead of drumming up outside work to enable them to live in comfort and decency."

"I have yet to find any tenable argument against the position thus defined. All experience only tends to confirm it, and some schools are, rather reluctantly, beginning to realize it.

"If it is true that 'the vast majority of schools cannot afford to pay for the exclusive right to a competent man's services,' does not this very fact prove beyond controversy that such schools are attempting and pretending to do that which in point of fact they really cannot do, and the students in these schools are unfairly treated, since the work done cannot be of the proper grade? I see no other sound conclusion to draw. Were it proposed to let all drug clerks practice as physicians, on the ground

that the vast majority of them have no time to study medicine thoroughly, you would no doubt remonstrate vigorously, yet this argument is as sound as the one just advanced. Until a school is able to command the services of a competent man to direct a course, it had better let that course alone, and confine itself to work which it can really do well. To do otherwise is neither fair nor honest, notwithstanding numerous specious arguments to the contrary.

"It is indeed absurd to 'grade a man as a mining engineer if he has never been down a mine nor felt the heat of a furnace,' but it is even more absurd to place in charge of technical courses men whose qualifications are almost as limited. Yet this will continue to be done, until school trustees, and the public as well, realize that *brains are worth money*, even in an educational institution. A man who is thoroughly capable of directing a department of engineering in a school, must not only be a good engineer, but possess all the additional knowledge and personal qualifications necessary to make him an educational expert. Is it any wonder, then, that professors of engineering are frequently regarded as men of an inferior grade, when it is a matter of daily observation that live corporations are willing to pay from \$5,000 to \$30,000 per annum to a man who is an expert in engineering alone, while schools offer \$1,500 to \$4,000 (seldom the latter) for a man who must know far more, if he is what the schools occasionally *want* him to be, and always publicly *claim* him to be? There is an idea abroad that the moment a man accepts a position in a school he must be prepared to work for little or nothing. Men who are not above suspicion as to honesty appear to accept this condition, while in reality they perform little real service for the school, and use their position before the public as a means to make enough extra money to bring up their income to a respectable figure. While some defend this, I cannot but regard it as a deception, since the public is not aware of the facts, and the students are defrauded of the care which the school ought to give them.

"In other words, educational institutions should be run on solid business principles, perform literally all they promise the public, and realize that the day has passed when schools, being under control of church authorities, could announce anything and have it instantly accepted by a public whose faith was very much more developed than its intellect."

Pig Iron Industry.

The advent of the Liberal administration brings to the fore the question as to whether the development of the iron industry will be interfered with by the proposed revision of the tariff. Iron producers will naturally hesitate to proceed with the legitimate development of their various enterprises (now passing through the somewhat critical initial stages) until the policy of the new Government is formulated. Believing that the Hon. Mr. Laurier and his colleagues earnestly desire to maintain and develop the industries for which nature has fitted this country, we feel quite sure that any legislation that may be brought forward with regard to the iron industry, during the coming year, will be along the lines of restoring confidence to the iron producers, rather than wiping out the industries which they have, during the past few years, laboured so faithfully to establish. No doubt pressure will be brought to bear upon the Government by certain consumers of iron in this country, who themselves possibly, in some cases, inadequately protected, somewhat naturally desire to enhance the earning powers of their own enterprises by taking something out of the producers of what they term their "raw material." In dealing with such complaints the Government must bear in mind that what is "raw material" for one concern is the "finished article" for another, and if the gauge be the labor employed in the respective industries, the manufacturer of pig iron is often entitled to far more consideration at the hands of the Government than the man who simply re-smelts the pig iron into foundry castings. If pig iron is made from Canadian ores and Canadian fuel there is no industry that equals it in the amount of labor employed, in proportion to the market value of the product.

In any revision of the iron duties, pig iron must be considered as a manufactured article of great labor value to the country. It is the initial stage, and must be taken as the basis of the whole industry. In considering the advisability or otherwise of lowering the duties, it must be remembered that the producer of pig iron from Canadian ores cannot in turn fall back upon any other producer to recoup himself for loss sustained. His only recourse, if he continues to run his furnace, is to cut down the wages of the men employed at the works and in the ore fields.

This would mean great hardship to the employees, and indeed is hardly practicable.

It has, we think, been amply proved, especially within the past three or four years, that iron of exceptionally good quality can be successfully produced in Canada, and that the existence of such industries, is of very great value to labor, to the railways, and indeed to every Canadian interest. The history of Great Britain, the United States, and the leading continental powers, shows the great part that the building up of the iron industry has had in the successful development of the nations. Canada cannot afford to be behind.

The progress of the Canadian iron industry, during the last few years, has been such that to-day Canadian iron is being sold throughout Canada at an average of from \$1.50 to \$2 per ton below imported American iron, and at a considerably greater reduction on British iron. The Canadian iron men are certainly not taking advantage of the full amount of the duty imposed at the present time, but \$4 per ton duty is not too much to guard against the periods of depression, when American producers invariably attempt to make a slaughter market of Canada, to the great detriment of the growing industries of this country. In considering the revision of the tariff, the question will come up as to how heavily, or otherwise, the present duties bear upon the tax-payers. It is interesting to note, for instance, that on an average sized cook stove, weighing, say 175 lbs., the total contribution to the \$4 per ton duty is, as a matter of fact, not over 20c. This by reason of the fact that Canadian pig iron is sold, as already mentioned, at considerably less than foreign. Then again, upon a cooking range, weighing 400 lbs., the contribution to the duty, in the same way, is not over a total of 50c. It is reasonable to suppose that these stoves will last for years, so that the contribution per annum to the duty is infinitesimal. In the same way analysis proves that the contribution of harvesting machinery is very light indeed. A plough weighing (iron and steel combined), 175 lbs., contributes to the protection of the pig iron industry perhaps the small sum of 25c. A binder of the very best type, the iron and steel in which, combined, weighs, say 800 lbs., contributes to the pig iron protection a sum not exceeding \$1. As a matter of fact, the experience of the past few years amply proves that home competition, as it grows, will in time entirely wipe out this tax, so far as the consumer is concerned, while at the same time industries affording a large amount of employment to Canadian labor are successfully retained in the country. The manufacturers of harvesting machinery themselves must admit that any industry that helps to increase the prosperity of the farmers, as for instance, the Quebec charcoal iron industries, to which we will refer further on, well compensates them for the comparatively small contribution that harvesting machinery in the initial years is called upon to make towards the protection of the pig iron industry.

The importance of the iron industry is well admitted in Ontario, where its value, for a long time, was best appreciated by the want of the industry. Sir Oliver Mowat, and his Liberal Government in Ontario, so well recognized this that they have recently added to the encouragement given by the Dominion Government, a bonus of \$1 per ton upon the pig metal product of Ontario ores, raised and smelted in that province. The result of this has been the establishment of the Hamilton furnace, and we know that a still greater development awaits Ontario, by the almost immediate erection of a 100 ton per day furnace, probably with steel plant attached, if the Government will show by their action that they intend to maintain the tariff, and encourage the industry by protection and bounty. We know, too, that in the Province of Quebec the manufacture of charcoal iron has attained such proportions, under the existing tariff and encouragement, that it is only a question of a short time, when (if the duty and encouragement is maintained) the industries now in operation will be largely developed. In the Quebec industries all the material used is Canadian—ore, charcoal, fuel, limestone and everything else that goes to make a successful iron industry. Seventy-five per cent. of the labor is done by the farmers of the Province, and

this over a large territory, the farmers finding profitable work during slack seasons, by delivering ore and wood to the furnace. Such an industry is a positive boon to any country. The peculiar benefits, for instance, of an enterprise such as that located at Radnor Forges, to the farmers of the surrounding country, has already attracted the attention of most eminent authorities. We recall to mind a speech made by Prof. Hy. M. Howe, of Boston, before the American Institute of Mining Engineers, on 25th February, 1893. Mr. Howe, specially referring to the works at Radnor Forges, and its great importance to the farming community, said :—

“‘An idle man’s brain is the devil’s workshop.’ How often have we in New England wished that industries, such as this, capable of giving employment to farmers and their sons during the long winter months, and in idle time between seed time and harvest, might be possible in our own farming districts of New England?”

The success of the industry at Radnor Forges, and all such industries so located, is of as vital importance to the agricultural class by which it is surrounded as it is to capital and labor, and we believe that our legislators, taking this into consideration, and also remembering what has been done in Sweden (where the conditions are exactly the same as obtain in Quebec) will hesitate to legislate such an industry out of existence, or even to hamper its growth.

With regard to the relative merits of a specific as against an *ad valorem* tariff on iron, it is a notable fact that all the countries that have built up iron industries have consistently applied the specific tariff in the matter of pig iron, experience having taught that it was impossible to apply an *ad valorem* tariff on this article, and at the same time prevent fraud. Take the highest class of charcoal iron, worth, say \$30 per ton, and take a given quantity of low class coke iron, worth \$12 per ton, and so far as the pig is concerned, it is impossible for any Customs officer to tell the difference in value. Of course it is possible to analyse the iron at a heavy cost, but even a chemical analysis does not determine the cash value of an iron, as its value in castings may be entirely a physical one.

The argument that a specific duty means that a poor man pays as much on his necessity as a rich man on his luxury, does not apply on pig iron, as it is a well known fact that a better quality and higher priced iron is required to make a poor man’s stove than that which goes into the manufacture of a rich man’s furnace, the stove requiring qualities in the iron that will allow a plate to be made exceedingly light, and at the same time strong. In the case of a furnace, a poorer quality of iron may be used because of the heavier body of metal in the furnace. Then again, a higher quality of iron must be used in the manufacture of material for structural work, railway car wheels, and other such castings, upon the strength and quality of which human life often depends.

The \$4 per ton specific duty on pig iron, now, imposed, does not, on iron delivered at consuming points in Canada, figure as high an *ad valorem* duty as is popularly supposed. In this connection official figures are surely the best guide. We take, for instance, the importations to the close of the fiscal year ending 30th June, 1895, and find that there were imported into Canada during that period 33,944 net tons of pig iron, of which the invoice value was \$370,574, equalling a cost of \$12.13 per standard ton of 2,240 lbs. at furnace. If we add to this an average freight rate of \$4 per ton from the furnaces in Scotland and the United States, it brings the cost of this foreign pig iron to \$16.13, delivered at any point in Canada. The specific duty of \$4 per net ton would therefore equal in the period named an average *ad valorem* duty of just about 27¾ per cent. Of course if we separate qualities we will find that on higher grades of iron, such as the charcoal metal produced at the Radnor Forges, Quebec, the \$4 per net ton duty is only equivalent to an *ad valorem* duty of about 20%, by reason of the heavier cost of production.

The papers read before the recent meetings of the British Columbia Institute of Mining Engineers and the Ontario Mining Institute will be reproduced in our September number.

The Coal Supply of Canada.

The *Engineering and Mining Journal*, of New York, in referring to the surplus coal supplies of the world, draws attention to the enormous deposits of this mineral in Canada as yet but partly tested and almost untouched by the miner.

In England and on the continent periodic prophecies are made that in a few years coal will become a luxury. The miner, however, continually follows the coal deposits into new and unforeseen localities. A notable instance is given of this by the recent discovery of a deep-seated coal field near Dover, in England.

In France, also, the able geologists in the employment of the State have succeeded in showing unexpected developments of coal beds.

In the United States, nature and man have combined to waste the anthracite coal beds. Man’s efforts, however, succeeding those of nature, still leave immense stores of this valuable fuel. While, however, the absolute tonnage of anthracite remaining untouched is very large, it is a fact that a very large percentage of the most easily accessible beds have been exhausted, and that the future prices must rule higher if dividends are to be paid. This forcible doctrine of necessity has to a great degree abolished the former waste of mining, and the anthracite operators now vie with each other in adopting systems of mining and marketing which will ensure the least waste of coal.

The great Pittsburg bed, so celebrated for its yield of coke, extends over an enormous territory. Its quality, however, and thickness deteriorate at many points, large tracts have been worked out, and the date of its exhaustion as a supply of coke of the quality now produced can be reckoned on at no distant date.

In Canada the British Columbian coal fields are worked to some extent, but must be favored by a home market for satisfactory development. To the east of the Rocky mountains there are many thousands of square miles underlaid by coal beds of every variety of composition. The fuel, anthracitic in the western portion of this almost virgin area, passes by gradations through the bituminous into the lignitic variety.

These enormous deposits, counting their coal contents not by the hundreds of millions, but by the thousands of billions, secure for unknown generations the warming of the settlers of the North-west as well as the motive power for their factories. These deposits could furnish the present coal supply of the United States for many hundreds of years.

Passing to the eastern extremity of the Dominion, this question of future coal supplies has been touched upon in a paper read before the Nova Scotia Scientific Institute by its president, Dr. Gilpin. He shows that in Cape Breton, in addition to the worked coal field, there are a number of other localities containing productive or true coal measures, as well as large tracts of land considered geologically as somewhat lower, both, however, showing seams of workable size.

The limited market open to the maritime coal mines has led to a feeling of indifference as to the value of coal lands in Nova Scotia. Few localities outside the Sydney coal field have a value beyond that afforded by primitive openings in natural exposures. The correlation and comparison, however, of the ascertainable facts leads to the conclusion that there are in the undeveloped districts coal supplies equal to any future demand.

Among these localities may be mentioned Mira, Salmon River, River Inhabitants, Glendale, Port Hood, Mabou, Broad Cove, Chimney Corner, Margaree, etc.

In Nova Scotia proper coal is produced in two districts, Pictou and Cumberland. The former district appears to be limited by older rocks, but in its vicinity are seams belonging to higher measures, and the extension of the equivalents of the present worked seams under these higher or newer measures is a matter of great interest. Similar problems are presented in the Cumberland coal field and at other points. The enumeration by Dr. Gilpin of the facts observed, as they bear on the surplus coal supply of Nova Scotia, would form an interesting supplement to the present paper.

NOVA SCOTIA MILL RETURNS.

The following returns have been made to the Mines Office since our last report :—

	Tons Crushed.	Yielding		Totals.			
		Oz.	Dwt.	Gr.	Oz.	Dwt.	Gr.
Sherbrooke District—							
New Glasgow Co., for month of July.....	274	184	..	..	
McNaughton Mill, for month of July.....	350	208	..	..	
Total tons.....	624	392	.	..	392	..	..
Moose River or Caribou —							
Cariboo Gold Mining Co., for April, May and June.....	274	218	17	..			
W. A. Sanders, for April, May and June.....	1195	150	12	..			
Damas Touquoy, for July (slate)	434	41	15	..			
Moose River Gold Mining Co., for July.....	289	66	..	..	
Total tons	2192	477	4	..	477	4	..
Uniacke—							
J. J. Withrow, for June.....	127	108	10	..			
T. R. Prince, for April, May and June	1220	113	10	..			
Total tons.....	1347	222	..	..	222	..	..
Fifteen Mile Stream—							
New Egerton Gold Co., for June.....	434	219	2	..	219	2	..
Brookfield, Queen's County—							
W. L. Libbey <i>et al.</i> , for July	470	396	..	..	396	..	..
Total yield since our last returns.....					1706	6	..

The Stock-Jobbing Boom.

The warning given by Judge Kingsmill to the Toronto Board of Trade and printed in our July issue does not seem to have had the slightest effect upon that class of people for whom it was intended. Within the last three weeks two or three companies have been incorporated and their stock thrown upon the Toronto and other markets, which have eagerly absorbed all that was offered and, like Oliver Twist, clamor for more. These stocks, like the "California," may ultimately prove remunerative, but at the present they are simply prospects; in fact the *Rosland Miner*, of Aug. 7th, in alluding to the incorporation, heads its column with these words, "A Great Prospect." As the bulk of this stock was sold for 10 cents a share the value of this "great prospect" at that rate would be \$250,000. Now we submit to our Toronto readers whether such work is following the spirit of the advice of the president of the Ontario Mining Institute? It is not, and (while personally believing that the "California" has an equal, if not a better, chance than other "prospects") such methods will lead inevitably to the position of considering mining simply as a gamble.

The situation has been brought about largely by the inflated ideas and stories that have come east, of the wonderful richness of the Trail Creek country, and of British Columbia's minerals generally. No sooner does a prospect in Rosland get through the iron cap and strike the ledge or vein than it is immediately incorporated as a company with a capital ranging from \$1,000,000 to \$3,500,000—this in spite of the fact that in but too many cases the ledge shows only low-grade ore. Immediately the incorporation is effected, half a dozen blackboards along Columbia avenue give a fictitious rating of from 5 to 10 cents a share, and the service of some expert is secured to report upon the "iron cap."

If some adventurous broker can get connections and introductions to Spokane or to Eastern Canada, he loads his grip with stock certificates and starts to unload "just enough stock to get a working capital and pay for our machinery." Usually this means that enough stock is sold to recoup the original outlay very handsomely and to provide a small fund for development.

We again call the attention of the investing public to these matters, and warn them that if they deliberately choose the gambling in stocks to the investment in known mines of proved value, there will be a day of reckoning for which the art of mining will have no responsibility whatever, but which will be due only to the cupidity and stupidity of man.

EN PASSANT.

The Ontario Mining Institute will hold its next meeting at Rat Portage, Ont., on Tuesday, 8th September. A good programme and reduced rates on the C. P. R. have been arranged, and it is hoped the attendance will be in keeping with the importance of the occasion.

Mr. John Hardman, the well-known mining engineer, has gone to Southern British Columbia in the interests of a strong syndicate of English and Canadian capitalists. Mr. Hardman's extensive practice and his mining operations in Nova Scotia and Quebec have compelled him to sever his connection with McGill, where he lectured with much acceptance last winter.

The vacant chair of Mining and Metallurgy at McGill has, we understand, been filled by the appointment of Dr. Porter, a graduate of the Columbia College School of Mines. After graduating he spent two years in the field study of the economic geology and mining and metallurgical possibilities of certain of the Southern States. For his investigations during this period, he received from Columbia the degree of Doctor of Philosophy in 1884. Dr. Porter was then requested to establish a department of mining and metallurgy in the University of Cincinnati. His work was most successful, and he gradually built up a practical laboratory for milling and metallurgical investigations. After an experience of four years in the university, he entered upon the active practice of his profession and for the next two years was engaged in the expert examination of mining properties and in carrying out metallurgical tests. During the last seven years he has been engaged in general engineering, his time having been occupied in field work in copper and lead, in hydraulic mining, in the mining and milling of gold, and in work on iron, steel and coal. Dr. Porter's testimonials speak of him in the very highest terms and all agree in the opinion that he is a man of unusual ability as an organizer and as an inspirer of enthusiasm in others, that he possesses a natural talent for arrangement and classification, which extends not only to material things, but to ideas and mental concepts. He is a man of wide reading and diversified tastes, is singularly lucid in explanation and successful in imparting information.

Some very wild statements have recently been published respecting the discovery of an extensive coal deposit in the vicinity of Sudbury on the C. P. R. The substance discovered there is not coal, though some-

what like it. It is well known and is fully described from various localities in Quebec and Ontario on pages 18-19 of Mr. Hoffman's report on Minerals of Canada, Vol. IV., New Series Geological Report, 1888-89. It is known as anthroxolite, a name given it by Professor Chapman. It is of no commercial value and has no relation to carboniferous or other more recent coal formations. The discovery in the Township of Balfour, Range 1, lot 10 (Sudbury sheet of the Geological Survey map), though of no commercial value, is of considerable scientific interest, because it occurs there in the same black Cambrian slates of the Sillery formation as it does throughout the Province of Quebec from Lotbinière to Gaspé, and again on the north shore of Lake Superior upper copper-bearing rocks of Logan, now known as Cambrian, and probably about the same age as those of Sillery and Quebec, where also, on strength of it, much useless expenditure was incurred searching for coal.

Our next issue will contain an interesting descriptive article on the silver-mining industry of British Columbia, from the pen of Mr. J. C. Gwillim.

The unprofitable condition of the coal trade of late has frequently raised the question as to how far it is possible to introduce further economies in the working of coal mines. The substitution of steam power for hand labor has done much during the past half century to reduce the cost of working. But now there are rival systems of the application of power to colliery working. There are those who advocate the use of compressed air; others electricity. Certain experts go so far as to declare that electrical power costs only about half that of steam—not only so, but that the cost of a steam plant for a given output is almost twice the cost of an electrical plant. In this comparison it is well to bear in mind that the steam plant used at collieries is generally of a rough and uneconomical character. Fuel is held of so little account at a colliery that economy in its consumption is too often regarded as of little consequence. This is a mistake which is beginning to be discovered. The *Iron and Coal Trades Review* avers that the probable consumption of coal in colliery engines, on the average, is not less than 6 lbs. per horse power per hour. This is a moderate estimate, and taking it to refer to indicated horse-power, it is possible to produce the same power with $1\frac{1}{2}$ tons of coal, or even less; hence it may be fairly said that there is a possible saving to be effected of seventy-five per cent., worth on the annual output of the United Kingdom, nearly £900,000. It would probably be well within the mark to say that the saving to be effected in labor of handling, and in the maintenance of boilers and appliances for consuming this, would be worth say 65 per cent. of the above sum, showing a possible economy of say £1,500,000 per annum, a sum equal to over 2 per cent. on the total value of the coal raised, or about $3\frac{3}{4}$ per cent. of the whole wages annually paid in the mining industries. And if the coal were raised unbroken, so that its value was equal to the average value of the coal sold, these figures would rise to 3 per cent. of the value of the total coal raised, or 6 per cent. of the wages paid. It may be stated at once that, to realise these economies, the power required must be produced by compound or triple-expansion condensing engines—appliances almost unknown in colliery work. Not many colliery proprietors, however, are enterprising enough at the present time to incur a large outlay for new steam plant. It may be that many are waiting to see the issue of new developments with the other agencies now coming into favor.

M. de Regaurd, a French metallurgist, claims to have discovered a new method of treating gold ores. A brief summary of the process is as follows:—The ore or tailings are treated with tetra-chloride of sulphur, which coming in contact with water is at once decomposed, forming sulphurous hydrochloric acid as well as a little sulphuric acid and free sulphur, but when auriferous mineral is present other reactions ensue with the ultimate result that chlorine is rapidly freed. The inventor expects to contract all of the gold contained in the tailings, slimes or what

ever he may be treating. His estimate of cost of treatment is at present drawn up upon the expectation of handling such tailings as are still plentiful in South Africa and many other places, and on the scale of 100 tons a day he figures that the delivery to the tanks will cost 67 centimes (13½ cents) per ton; the cost of labor will be 1.50 centimes per ton, chemicals and supplies 50 centimes, general expenses 1 franc 30 centimes, making total cost of 3 francs 97 centimes, to which must be added the cost of the purchase of the tailings. In his own estimate, basing the cost of the tailings at 3 francs per ton, and adding 2 francs per ton for sinking fund, he arrives at a total cost of nearly 9 francs, or in round figures \$1.80 per ton.

The bursting of a fly-wheel is almost unheard of in England, says the London *Engineer*, notwithstanding the high-speed engines we now have running, yet in the United States the fly-wheel casualties have become a matter of weekly report. In England we have many thousands of high-speed cast-iron fly-wheels and very large wheels up to 60 tons weight, running with very high periphery speed, and they all run safely, and yet in the States they say: "The sudden advent of electrical apparatus and its high speeds found people making fly-wheels of cast-iron, with a narrow factor of safety, or, indeed, no factor of safety at all, if we consider the impossibility of detecting inherent strains and imperfections in this material. No one can know the value of material molded into form at a temperature of 2,000 degrees and then cooled down to a fortieth of this temperature, nor can they judge internal structure by surface indications. The fact is that cast-iron is not suitable material for fly-wheels that are to be driven at high speed, nor is it necessary to make them of this material. There is not even the claim of cheapness in their favor, if the methods of making such wheels of wrought iron and steel were once worked out. Twenty years ago a Scotch firm, who had to make a large fly-wheel for a spinning mill, riveted up a box rim, made from rolled plates, and filled it with cemented masonry or 'grout,' and did a very sensible thing."

In a paper read before the Society of Arts on "The Use of Compressed Air in Tunnelling," Mr. E. W. Moir, M.I.C.E., states that at one time on the Hudson river tunnel, out of the forty or fifty men employed there was one death a month. By treating the bad cases homœopathically this enormous death-rate was reduced to only two deaths in fifteen months out of 120 men employed. When attacked, the men were placed in a special air chamber and the pressure raised to one-half that in the tunnel. The pressure was then gradually lowered at the rate of about 1 lb. per minute. Even in severe cases the men left the chamber quite cured. Mr. Moir also states that it is important to have pure air in the tunnel, an increase of sickness occurring when the proportion of carbonic acid exceeds one part per thousand. It is also advisable to give every man a cup of hot coffee before he comes out of the compressed air; a warm room should be provided to dress in, as well as extra clothing to wear inside the lock.

More than 1,250,000 tons of coal are consumed yearly by the famous Krupp works at Essen, Westphalia, commenced in 1810 by Peter Friedrich Krupp, and now in the possession of Herr Friedrich Krupp, member of the Reichstag. The establishment consists, according to the *Eisen Zeitung*, of two steel works with fifteen Bessemer converters; four steel works with Siemens-Martin open hearth furnaces; iron, steel and brass foundries; puddling, melting, reheating and annealing furnaces; draw benches; a hardening and tempering department; file manufactory; rolling mills for plates, rails and tires; railway spring and wheel manufactory; steam hammers, forges, axle-turning shop, boiler shop, engineering and repair shops. Besides the above and many other departments, at Essen, connected with the making of canons, there are steel works at Annen, in Westphalia, three collieries in Westphalia, besides participation in several others; 547 iron mines in Germany; various iron mines at Bilbao, in Spain; four iron works, including one at Duisburg, one at

Engers, one at Neuwied, and one at Sahn; various quarries of clay, sandstone, etc.; four steamers, and artillery ground at Meppen, Hanover. The property owned extends over 974 hectares; and the number of hands employed in the mines and steel works is 25,301. There are altogether 1,500 furnaces of various kinds, 3,000 engines and machine tools, 22 roll trains, 111 steam hammers, 2 hydraulic presses, 263 stationary boilers, 421 steam engines, representing together a force of 33,139 horse-power, and 430 cranes, including travellers, having a collective lifting power of 4,662 tons. The total length of the shafting is 8.8 kiloms. (5½ miles), and that of railways, standard and small gauge, 85 km. (53 miles), worked by 32 regular trains, with 33 locomotives. The annual consumption of coal amounts to 1,253,161 tons, and that of lighting gas to 12,000,000 cubic metres (423,799 cubic feet), while there are 573 arc and 1804 incandescent electric lamps.

Nickel steel has just been exhaustively tried in the German navy for the propeller blades of small craft, and the results, it is stated, have been very satisfactory, particularly in respect of the absence of corrosion, which plays havoc with the screw propellers of torpedo boat craft, owing to the blades being very thin. In the course of the experiments the common steel propeller fitted to one boat was found after only three months to be badly corroded, while the nickel steel screw propeller was in good condition. Both boats were alike and had been subjected to the same steaming tests. A similar test was not so satisfactory.

Dr. John Haldane has presented to the Home Secretary a "Report on the Causes of Death in Colliery Explosions and Underground Fires," which is founded partly on the recent explosions at Tylorstown, Brancepeth and Micklesfield, and in which some fresh conclusions of the highest scientific and practical moment are arrived at. From an examination of bodies found after the fatal explosion in the Tylorstown pit it was established that many cases of death were due to poisoning by carbon monoxide, and this was supported by the symptoms experienced and described by members of the rescue party. Further evidence seems to point distinctly towards carbon monoxide being present in dangerous amount in the after-damp of all great colliery explosions. That insufficiency of oxygen does not account for the loss of life is shown by the fact that rescuing parties are sometimes driven back by an atmosphere in which at the same time the lamps burn quite brightly. Dr. Haldane believes that many lives have been lost through ignorance of the fact that the lamps, to which miners trust for the recognition of other gases, give no direct indication of carbon monoxide. In the Tylorstown explosion oxygen sufficient to support life must have been left in the air-ways all along the track of the explosion. At the very least 5 per cent. of oxygen, or 25 per cent. of pure air, must have been present. This fact came to the investigator as an entire surprise, and on further enquiry other evidence was obtained of the presence of oxygen even immediately after the passage of the flame. Dr. Haldane thinks it would probably be safe to assume that at least 50 per cent. of air is on an average contained in the after-damp along the traversed air-ways just after the explosion, and that at places there is 80 per cent. or more of pure air. Experiments on the lethal power of carbon monoxide, taken together with these data, leave it probable that the mixture of gases left along the track of the explosion contained on an average about 1 to 1½ per cent. of carbon monoxide, 50 to 70 per cent. of air, 4 to 6 per cent. of carbonic acid, and the rest chiefly nitrogen. The presence of 4 to 6 per cent. of carbonic acid would cause slight panting, but nothing more. Along with so much carbonic acid the deficiency of oxygen would have practically no effect, since the panting caused by the carbonic acid would increase the oxygen supply to the lungs, and thus compensate for the deficiency of oxygen in the air. The percentage of carbon monoxide present would be far more than sufficient to cause death, but the interval before death would certainly be considerable. The interval would amount to about 40 minutes or an hour. This, then, would be the interval

available for rescue. Loss of consciousness would occur much earlier, probably within 8 to 12 minutes.

The trial of the case of Lowenberg, Harris & Company vs. Joan Olive Dunsmuir was commenced this month in Victoria, B.C., before Justice Walkem. The plaintiffs are real estate and financial agents of Victoria, and the defendant is the widow of Hon. Robert Dunsmuir, the owner of the Wellington and other collieries. The plaintiffs sue for \$22,000 for expenses and loss of time in attempting to sell for the defendant the Wellington collieries. In September, 1890, according to the statement of claim, the defendant appointed Mr. Dennis R. Harris her agent for the sale of the collieries, and the price stated was \$2,600,000, and Mr. Harris was to get a commission of 5 per cent., which was to cover all his expenses. Mr. Harris then set out for New York, where he arrived at the time of the Baring Brothers' failure, and on account of which he decided to return to Victoria, as capitalists in London would not be likely to venture on his proposition just then. The negotiations were kept up by the plaintiff for some three years and eventually dropped. The last paragraph of the claim reads: "The plaintiffs submit that they in reality secured a purchaser for the said property for the price which the defendant eventually fixed for the sale of the same, and that they would have succeeded in effecting the said commission but for the difficulties placed in their way by the defendant and her agents, and the delays occasioned by her withholding instructions." In his evidence, Dennis Harris said he had received a statement from R. Dunsmuir & Son, which showed that the total profits for the Wellington mines, including steamships, for eight months in 1891, was \$347,162. Messrs. Dunsmuir at first wanted £35,000 for the steamers Wellington and San Mateo, but afterwards offered to include these with the mines and accept the original offer. Then they offered to take £100,000 debentures and £66,000 stock in the company which was to be formed to buy the mines. This colliery, which earned a profit of \$347,162 during a period of eight months in 1891, doubtless earned even more last year.

In the course of the discussion which followed the reading of Mr. William Beardmore's paper on nickel steel, Mr. James Riley, of the Steel Company of Scotland, gave some useful information as to the properties of this metal. He said there were, in the series of nickel steels, some most valuable properties to which the author of the paper had not referred. In all of them the susceptibility to corrosion was less than that of carbon steel, and it increased as the quantity of nickel increased, until, with 25 per cent. and upwards, the steel was practically non-corrodible. Then this alloy of 25 per cent. nickel steel had some other striking properties. It had great strength as well as wonderful ductility. It could therefore be flanged and stamped into forms with great facility, and it could be drawn into tubes or wire with perfect ease. A specimen was drawn into wire of surprising fineness, a piece weighing one kilo. being drawn into a thread of 21 kilometres long. Unfortunately that particular alloy had one great drawback—it was very difficult to machine. It might be punched without the least trouble, but it was almost impossible to drill a hole through it. There can be little doubt that in a very short time great use will be made of this alloy—one of the most interesting of the whole series. Possessing great strength, with very great ductility as well as non-corrodibility, it will speedily recommend itself in a thousand forms, notwithstanding that peculiar quality which renders it so refractory to machine tools. Think of the service this alloy might have rendered in the construction of the Forth bridge or the Eiffel tower! If these great structures had been built of a material of 40 tons strength instead of 30 in the one case and 22 in the other, the bridge would have become more light and airy and the tower more net-like and graceful than they are at present.

In a recent contribution to the proceedings of the North of England Institution of Mining and Mechanical Engineers, Mr. Henry Hall, one

of H. M. Inspectors of Mines, described "Some Aspects of Recent Colliery Explosions." The paper dealt with the initiation of colliery explosions as distinct from their development and extension, the latter branch of the subject having, in the opinion of the writer, received more than its fair share of attention, while the initiation of explosions had been somewhat overlooked. The initial flame sprung in most cases from open lights and blasting gunpowder, although spontaneous combustion and accidental fires were also sources of ignition. Very few explosions, however could be traced to the latter agencies. It was a noteworthy fact that the recent colliery explosions had occurred in mines previously thought to belong to the non-dangerous class. At Cammerton (Somersetshire), Blackwell (Derbyshire), Brancepeth (Durham), and Micklefield (Yorkshire), where explosions had recently taken place, the collieries were regarded as so safe that open lights were used, and blasting with gunpowder was resorted to when necessary. At Cammerton the explosion originated in an intake air-road, and was supposed to have been caused by a shot of gunpowder fired there. There were two deaths, and the effects were visible over 1,200 yards of road. This colliery had for 100 years been worked with open lights only. The seam was partially dusty. The coroner's jury declared themselves unable to assign any cause for the explosion. At Blackwell also the explosion occurred in an intake air-road, and was attributed to a shot of gunpowder. There were seven deaths, and the effects were of a sweeping character. The seam was only partially dusty; open lights were used, though safety lamps were occasionally employed, more especially after any cessation of working. The jury attributed the accident to an overcharged shot of gunpowder, but expressed themselves of opinion that the evidence had failed to define any secondary cause. At Brancepeth the explosion occurred under similar conditions, and the effects extended over three miles of roads, resulting in 20 deaths. The seam was dusty. The jury found that the accident was caused by the firing of a shot. At Micklefield the explosion was caused by an open light, though the colliery had been worked with open lights for 23 years. There were 63 deaths. The jury attributed the accident to gas, and exonerated everyone from blame. A shot of gunpowder had in each case been fixed upon as the initiatory cause, but as open lights were in use, it must have been difficult to decide with certainty that the disasters were due to blasting. If they were fire-damp explosions, how was it that the large body of gas which must have been present escaped being ignited by the open lights previous to the blasting? Out of 164 fatal and non-fatal explosions during 1895, 136 were due to open lights, and 29 out of a total of 55 deaths were attributed to the same cause. The geographical distribution of the explosions was remarkable. Scotland and South Wales had many more explosions than the English counties, Scotland having almost twice as many as the whole of England together. It was notorious that Scotland and South Wales had adhered to open lights, while these had almost totally disappeared from the English counties. The year 1895 was by no means singular as regarded explosions. The number of deaths by explosions of firedamp or coal-dust during the 22 years previous to 1895 was 4,914, of which 1,583 were set down to open and mixed lights and 1,853 to blasting with gunpowder or some other firing explosive. This meant that 70 per cent. of the total deaths were due to these two causes combined. A further fruitful source of accident in open-light collieries arose from sparks from candles or lamps coming in contact accidentally with charges of explosive, either when in transit or in process of charging. Laxity of discipline also sprang from the use of open lights, the men smoking, carrying matches, and behaving as though they were quarrying instead of mining. It was absolutely impossible to be certain that firedamp would never make its appearance in a mine. The mining profession ought, of their own motion to put an end to practices which were a flagrant breach of good mining. A large majority of the men who carried out the actual management of the mines were ready to give a decisive vote against the use of both open lights and gunpowder. There was, however, constant pressure put upon them to produce cheaply, to which more attention

seemed to be given than to the disposal of the produce at remunerative prices. No premium, in the shape of high wages, ought to be paid as a set-off against risk.

"Man being reasonable must get drunk; the best of life is but intoxication." So sang Byron, and now to parallel this defence of one form of excitement it has been ruled that a man's indulgence in what have been called "speculative gambles," is recognisable by law. Gambling in shares has often been deprecated by the unco guid, even the moment after paying a life insurance premium, which is in itself a mere taking of the odds offered by the insuring company that you wont die within the next twelve months: but the practice of buying for a rise and selling for a fall has always been regarded as a transaction of doubtful legality. So strongly has this view been held that a Montreal clerk named Ostingy, whose name should certainly have been spelt without its initial O, after getting several thousand dollars in arrears with his broker, one Forget—who will not readily Forget his slippery client—refused to pay, alleging that as the broker knew he bought that which was never to be delivered, and so made the affair one of speculation, not of investment, he had no legal claim. The broker sued, and the court upheld the clerk's view of the case, declaring the deal to be a gamble, and therefore illegal. The broker, however, carried it to appeal before the Privy Council, which has reversed the Canadian decision and decided in favor of the appellant. The Lord Chancellor, in giving judgment, declared that "it did not matter whether the broker knew that Ostingy's object was speculation and not investment. Such contracts were sometimes spoken of as 'gambling on the stock exchange,' but it certainly did not follow that the transaction involved any gaming contract. A contract could not properly be so described because it was entered into in furtherance of a speculation. It was a legitimate commercial transaction, and one of every day occurrence, to buy a commodity in the expectation that it would rise in value, and with the intention of realizing a profit by its re-sale. The legal aspect of the case was the same whatever be the nature of the commodity, whether it be a cargo of wheat or the shares of a joint-stock company. Nor, again, did such purchases and sales become 'gaming contracts' because the person purchasing was not possessed of the money required to pay for his purchases, but obtained the requisite funds in a large measure by means of advances on the security of the stocks or goods he had purchased. That was also an everyday commercial transaction." After other observations, the Lord Chancellor said their Lordships thought the judgments of the courts below ought to be reversed, with costs. But in regard to the costs of the appeal they considered that as Forget was allowed to prosecute it, notwithstanding the small amount at stake, upon the ground that it involved a question of wide general interest, he (Forget) should bear the costs of the appeal on both sides.

At the greatest depth ever attained by miners in the history of the world, the mines in the vertical Red Jacket shaft of the Calumet & Hecla copper mine have recently stopped sinking at a depth of 4,900 feet, as this is the required depth necessary for this company to reach the limit of its underground territory. Bored wells have been carried down to a greater depth, but the Red Jacket's shaft is the largest and best constructed mining shaft in the world. Its inside dimensions are 14 x 22½ feet, divided into six compartments and timbered throughout with pine. The shaft was started in the fall of 1880. The new shaft rock house, which will be built of iron and will be made fireproof throughout, is the only part of the work necessary to put this deep shaft in commission, as the hoisting machinery, which consists of two pair of triple expansion engines of 3,000 horse-power per pair, and will hoist a load of 10 tons sixty feet per second, was planned and put in place while the sinking of the shaft was going on.

Capt. E. Moss, who has just returned to London from the Transvaal tells the story of the monkeys who work for him in the mines: "I have

twenty-four monkeys," said he, "employed about my mines. They do the work of seven able-bodied men, and it is no reflection upon the human laborers to say that they do a class of work that a man cannot do as well as they. In many instances they lend valuable aid where a man is useless. They gather up the small pieces of quartz that would be passed unnoticed by the workingmen, and pile them up in little heaps that can easily be gathered up in a shovel and thrown in the mill. They are exceedingly adept at catching the little particles, and their sharp eyes never escape the very things that the human eye would pass over. When I went digging gold I had two monkeys that were exceedingly interesting pets. They were constantly following me about the mines, and one day I noticed that they were busily engaged in gathering up little bits of quartz and putting them in piles. They seemed to enjoy the labor very much, and would go to the mines every morning and work there during the day. It did not take me long to learn their value as laborers, and I decided to procure more. So I immediately procured a number, and now have two dozen working in and about the mines. It is exceedingly interesting to watch my two pet monkeys teach the new ones how to work, and, still stranger, to see how the newcomers take to it. They work just as they please, sometimes going down into the mines when they have cleared up all the debris on the outside. They live and work together without quarrelling any more than men do. They are quite methodical in their habits, and go to work and finish up in the same manner as human beings would do under similar circumstances."

A recent patent for hydraulic mining machinery specifies a combination of a lower sluice-box provided with riffles and having its exit end tapered or converging, the upper conductor having the "flaring" mouth-piece fitting in the converging end of the lower sluice-box, the upper sluice-box having the enlarged mouth portion and the reduced terminating portion, the upper walls formed with the transverse separating blocks, and the lower walls of the upper sluice-box being provided with riffles and the forcing nozzle above and below the lower sluice, whereby the forcing nozzles serve to force or drive the material toward the converging end of the sluice-box through the conductor to the enlarged mouth of the upper sluice, the separating blocks separating the gravel and lower riffles of the upper sluice receiving the ore and preventing it from being carried away and preventing jamming in the sluice.

In some blasting operations for removing submarine rocks lately carried out at Emmerich, on the Rhine, black powder was employed in water-tight cases, fired by safety fuse. The great difficulty occurred in tamping the shots under water; but this was at length successfully accomplished by running into the hole over the charge, by means of a funnel, quick-setting cement in a liquid state. The tamping, from 1½ to 2 metres long, was effected by means of tubular drifts, like gas pipes, toothed on their lower edge.

"Hope springs eternal in the human breast," especially in the mind of the mining manager. Read the reports: "Country remains hard and tight, requiring much shooting, but"—hope springs eternal—"we hope to strike something payable shortly." Another: "The reef has pinched right out. We believe that we are driving in the right direction, and have no doubt we shall strike it again." Once more: "All the workings are full of water, but I have no reason to doubt that the representations made by the previous proprietary will prove well-founded." If anyone has the patience to peruse the column of mining reports, he can put in the remainder of his spare time estimating how much "hope" will pan out to the ton if properly crushed and reduced. Well, it is hope that keeps mining operations going, and very often, we are glad to say, pluck and perseverance are richly rewarded.

CORRESPONDENCE.

Notes on a Visit to Cripple Creek.

SIR:—

It is generally thought that as regards mining the best things are put in the worst places, according to nature's law, "nothing without labor." In visiting a mine, one expects to go to the rudest and wildest region, and to climb up endless trails and go to almost inaccessible heights before one reaches the favored spot, where an excess of wealth has been concentrated in the rocks. A remarkable exception to this rule is Cripple Creek in Colorado, where the railroad carries you through the rocky passes and brings you up to a plateau, 10,000 feet or more above the sea, diversified by moderately high hills, where there is very little timber, and one can drive in a buggy to the pit mouth of near a hundred mines.

The Cripple Creek region is under the shadow of the famous Pike's Peak, the great landmark towards which the overland pioneer wended his way with wagon labelled "Pike's Peak or bust." Though tramped over for many years, no one imagined its dull looking grey rocks to be valuable, but about four years ago assays proved the worth of the ores, and exploration showed that a large region contained deposits of mineralized rock that ran high in gold, some kinds known as silverite and telluride going up into the thousands of dollars to the ton, and large masses of rock yielding an average of \$40 or \$50 to the ton, the cost of treatment and mining and transport being \$15 to \$20.

Although elevated 7,000 to 10,000 feet, there is but little snow, waggons are on wheels all the year; railroads run to the pits and Cripple Creek is the ideal mining camp of the world.

The Cripple Creek District contains about a dozen towns within a radius of four or five miles, some of them quite thriving cities. Cripple Creek is the largest town, and the camp contains about 20,000 inhabitants.

Cripple Creek had two disastrous fires at the end of April and the beginning of May this year. The business part of the town was mostly wiped out, but a month later many structures had arisen and good brick buildings were replacing the former tinder-like structures. The scene presented by the streets was unique and indescribable, and the study of faces and costumes was most interesting. Many gleams of humour were manifested by the burned-out business men, who were starting anew in tents or shanties, awaiting the rearing of new edifices. One tent bore the inscription "The Rocky Mountain Liquor House, the same old Sam always at home," another inscription was, "The Roxbury Kye Man is still here," "Nolan's Place" designates a store.

The railroad roams around among the mines and before its terminus is reached nearly all the principal producers of ore have been pointed out by the obliging newspaper man. Here is the Independence mine, the greatest of all, owned entirely by one man, Mr. Stratton, who a few years ago was poor. The mine has fine buildings and machinery, and a shaft 700 feet deep, and is turning out any amount of wealth, and could produce much faster, but the owner "doesn't know what to do with the money." There is the Portland, the next richest mine. Operated first by three poor men, it was bonded for \$200,000 and \$20,000 cash down to the Vanderbilts and others who sank their money and threw up the bond. The owners went on, got pay rock from the grass roots down, packed ore on their backs in the night and were able to pay for defensive litigation, no one knowing where the money came from. Now the mine is paying \$60,000 a month, and the owners are millionaires. "Yet they don't put on no a.s." The Anna Lee is pointed out, that had "a forty foot vein of three ounce ore," but a cave-in that cost life has hindered work.

The Anaconda started in on rich ground of such extent, that at first they simply "shipped the hill." A thriving town of the same name, with electric lights has sprung up as the result of this industry. "The Pharmacist," developed by a former drug clerk, is another of the successful mines. The Elkton, located by a poor prospector, has given him a fortune, and is making money for the company that operates it. The Victor, a million dollar mine, operated by a French syndicate, is pointed out, and the thriving city of Victor adjoins it with many good buildings and electric light. The mines of Raven Hill appear and the story is told of the operations of Baron Reichenow and a great syndicate with the Earl of Essex at its head. The Altman mine is seen surrounded by the town of Altman, the highest mining town in America, 11,000 feet above the sea. The Isabella, the oldest mine in the camp, is remarked upon, and among other noted mines are mentioned the American Eagle, Last Dollar and Vindicator. A mine with a remarkably written name is the X I O U S.

A drive in a light buggy with a lively span of black horses took in all the mines and towns in the course of three hours. Distant ranges of mountains 130 miles away were distinctly visible, and the cool dry rare air was exhilarating though difficult to inhale in long breaths when climbing rising ground. Concentrators and samplers abound, and two railroads take the ores to smelters at Denver and Pueblo. About \$12 to \$20 is believed to cover all costs, and the ore of the best mines is thought to average \$40 to \$50 a ton, with occasional shipments that go from \$100 to \$200. The railroads make money, charging 43 cents per 100 lbs. for a 30 mile haul, and the golden product brings wealth to many industries accessory to mining.

From one point in the drive over 500 prospect holes were counted on the hill-sides, the dumps of most of them probably being monuments of disappointment. Thousands of these signs of exploration were seen.

Many of the mines are worked on leases of a year's duration. The owner receives 15 to 40% of the output and gets his mine developed without any expense. If the mine turns out rich he gets the full benefit on the expiration of the lease. The system is not thought to be generally advantageous to the lessee, as he has to make all the outlay and often puts in extensive machinery and plant, and has only a short term to reap profit. The Maloney lease, however, was said to have given \$100,000 gain in a year.

One man that was visited evidenced the struggle that these men who lease have to maintain. "It costs me about \$1,000 a month," said the man, "and so far our ore only averages \$10 or \$12 a ton, though we get some high assays. But a man who has worked in a mine where they are getting silverite, says they went through just such rock as ours before they struck the rich ore, and I think it may come in with us soon. But I don't know how to pull along. I would give a half interest to anyone that would pay expenses of working." The wife put in a longing wish to get done with it and get back to the home where they had comfort even if not wealth. Many are called to mine but few are chosen to get rich at it. But the few successful ones give the call to the many.

There are about 100 working mines at Cripple Creek and as many as 25 are believed to be making profitable shipments.

An unusually large number of "wildcats" have been floated on the reputation of the paying mines, and investors need to be cautious in placing their money.

ROBERT C. ADAMS.

Montreal, 15th August, 1896.

Mr. Pellew-Harvey's Lectures.

To the Editor:

SIR,—The British Columbia *Mining Record* for June and July has given us the treat of a *verbatim* report of Mr. W. Pellew-Harvey's two lectures on "Metals and Metallurgy," given under the direction of the Minister of Mines for B.C. Whether from wisdom born of experience or otherwise, Mr. Harvey announced that "The subject of the treatment of ores is rather an advanced one for the miner," and hence thought it advisable to give instead a rambling-disconnected discourse on blow-pipe work, mineralogy, sampling and qualitative tests, winding up with a talk about tin in Cornwall.

We have Mr. Harvey's own word for it that the "Minister of Mines is well pleased with the success of these lectures" in Victoria and New Westminster; this is very gratifying, but one would like to know whether the minister is not alone in his pleasure.

One resident of Vancouver writes me that the miners are anything but pleased at the lectures which have been given.

But is the Minister of Mines equally pleased to have Mr. Harvey deliberately tell his audience, who are supposed to be men directly dependent upon mining for a living, that "mining, you understand, is but a gamble anyway?" If the subordinates of the Department of Mines entertain such an erroneous conception of mining as Mr. Harvey enunciates, it is time the minister reorganized the staff of lecturers, and employed men who will not traduce his department upon the public platform.

Montreal, Aug. 6th, 1896.

Yours, etc.

DURHAM.



MIDSUMMER MEETING

OF THE

Mining Society of Nova Scotia.

The midsummer meeting of the Mining Society of Nova Scotia was held on 27th ultimo, at the rooms of the Society in Halifax, the President, Major R. G. Leckie, occupying the chair. The attendance was not as good as usual, among those present being Messrs W. Blakemore, B. C. Wilson, J. H. Austen, Chas. Fergie, J. E. Leckie, Captain Harding, Dr. Gilpin, C. C. Starr, W. L. Libby, E. R. Faribault, C. E. Willis, and H. M. Wyld.

The minutes of the March meeting were read by the Secretary and adopted.

A telegram was read from Mr. B. T. A. Bell expressing his regret on behalf of the members of the Quebec Association at their inability to be present, and conveying to the Society his wishes for a successful meeting.

The Secretary was requested to acknowledge same.

Election of Members.

On motion of the Secretary the ballot was suspended. The following gentlemen were then proposed for membership: Mr. Hiram Dinkin, Mr. W. H. Weston, Mr. Henry E. Weston and Mr. H. E. Hill.

On motion they were declared elected members of the Society.

Committee on Mining Legislation

Mr. BLAKEMORE referred to the resolution adopted at the last meeting that the committee on Mining Legislation be requested to continue their labors. He wished to urge upon them the importance of convincing the Government of the necessity of the proposed changes and the proper time to do so was before the house was in session.

Mr. FARIBAULT, said that the chairman of the committee, Mr. Drysdale, urged that their plans be thoroughly matured before the meeting of the Legislature so that better success could be anticipated.

Dr. GILPIN said that the resolutions of the committee had been carefully gone over by the Commissioner, some of which had impressed him favourably, while as to some of the other proposed changes he had some doubts as to their advisability.

THE PRESIDENT said that as some of the proposed changes would affect revenue, the proper time to interview the Commissioner is before he makes up his returns.

Mr. BLAKEMORE suggested that the convener of the committee take up the work and have an interview with the Commissioner without delay.

A Government Diamond Drill.

Mr. Roy D. Hunter of the Sullivan Machinery Company, of Chicago, having been granted leave, addressed the Society on the subject of Diamond Drills and the benefits to be derived from the use of same in prospecting. He asked that a resolution be adopted urging the Government to purchase one. He stated that the Governments of Newfoundland and Ontario had each purchased a diamond drill some years ago, which had proved of valuable assistance to the mining industry. The drill purchased by the province of Ontario cost about four thousand dollars. The regulations governing the management of the drill provide that it may be supplied to owners of mineral property or others desiring its use on their giving a bond for payment of the cost of working it. In order, however, to encourage the opening up of properties by means of the drill the Government of Ontario undertook to pay about one half the expenses of boring with same, the other half being paid by the prospector. Mr. Hunter stated that he had had an interview with the Hon. Mr. Murray, Premier of the Province, with reference to the government purchasing one and operating it on the same plan. The Premier expressed himself as favourably impressed with the idea, but as there was no appropriation no immediate action could be taken. The Premier sug-

gested that if the mining men of the province expressed their desire that the Government purchase a drill it would receive the careful consideration of the Government. Mr. Hunter therefore asked that a resolution be adopted by the meeting urging the Government to purchase a diamond drill.

A short discussion followed in which Mr. Blakemore, Mr. Fergie and Mr. Willis took part, and it being the general opinion that the drill would be a valuable aid to the mining industry of the province, the following resolution was unanimously adopted on motion of Mr. Fergie.

"That the committee appointed to consider the amendments to the mining legislation be requested to express their approval of the purchasing of a diamond drill, to be hired to prospectors on a similar basis to that adopted in the province of Ontario." The meeting then adjourned.

COMPANIES.

The London and British Columbia Goldfields, Limited.—The first statutory meeting of the London and British Columbia Goldfields Company, Limited, was held in London last month. The Chairman (Mr. A. Johnstone Douglas) presided, and there was a numerous attendance of shareholders.

The Chairman, in opening the meeting, said: It may have surprised some shareholders when they received the notice for a statutory meeting of our company, which, as you are aware has only been in existence for about a month; but owing to the suggestion made by the Committee of the London Stock Exchange certain trifling alterations had to be made in the Articles of Association which rendered it necessary to call a special meeting. The directors' thought they would best consult your convenience by calling a general meeting on the same day; hence this meeting at this early stage of the Company's existence. It will be obvious to you that the directors are not able to afford you much information—there is no report and no balance-sheet. I may remind you, however, that the nominal capital of the Company is £200,000, divided into 197,500 ordinary and 2,500 deferred shares. Our first issue of 100,000 shares was over-subscribed, and we have allotted the whole of it to *bona fide* subscribers, of whom there are upwards of 500. We have paid nothing to the founders, we start with a clean sheet, and we have the whole of the subscribed capital available at the banker's. We have already many valuable options on offer, some of which, no doubt, we shall be able to handle at once, and upon very advantageous terms; but I think you will agree that it would be highly undesirable to enter into any details or to disclose the nature of the negotiations upon which your board are presently engaged. (Hear, hear.) I will, however, ask you to accept my assurance that the nature of our business is such as to warrant me in prophesying a profitable and speedy career for the Company. (Applause.) Much of the success of a company of this kind depends upon the character and reputation of those who represent it abroad, and I am happy to be able to inform you that in Mr. Fowler, our inspecting and mining engineer, we have a gentleman in whom we can place the utmost confidence. He bears the highest character for independence and for upright judgment, and his opinions on British Columbia have hitherto been highly valued. Your directors consider that in securing the exclusive services of Mr. Fowler in British Columbia they have been most fortunate. Mr. Geo. Alexander, your local director, is a gentleman known to some of your directors here, and they feel that they can place the utmost confidence and reliance upon him. He is a resident of the centre of the Kootenay district and really knows everything that is worth knowing there. Your local manager, Mr. J. R. Robertson, left this country for British Columbia on the 24th of last month. We have heard of his arrival and have, in fact, already had cable communication to him as to certain properties which we hope to acquire. As a shrewd, hard-headed man of business we believe that he is almost without an equal, and we consider that his services will be most valuable to you. (Hear, hear.) Let me say one word as to the field of our operations. British Columbia is a vast field for capital and enterprise. It is as well known to you as to myself that it is a gold-producing country, and its incalculable mineral resources are well known to all experts. In spite of its long winter, British Columbia has a splendid climate, labor is plentiful, and it has magnificent water communication, to which will shortly be added an improved system of railway communication. There is an abundance of timber and great capabilities of agricultural development, and all those natural resources which only require money to turn them to profitable account. For many years placer mining has been carried on on the banks and in the beds of the British Columbian rivers, and it has only been recently that reef mining has begun. In one creek in the Cariboo district, called William's Creek, the hydraulic process which has been introduced has turned out gold to the amount of four millions of pounds. Notwithstanding the auriferous-bearing strata of this country, the gold industry has only been carried on in small districts, and the result of these operations shows to my mind what an immense scope there must be for a company such as ours. (Hear, hear.) I could go on singing the praises of British Columbia in terms which would perhaps not tend to the improvement of the standing of our company from a commercial point of view, because I daresay you will agree with me that one is apt rather to try to picture El Dorado of wealth in a country in which one has money invested; but I think I am quite safe in saying that those who know the country best are of opinion that in British Columbia there is a vast field for enterprise and for investment. I shall be happy to answer any questions which any shareholders may wish to put. Before I sit down I should like to say that it will interest you to know that one of your board, Mr. Forster, proceeds to British Columbia within the next few days, and we hope that when we meet on a future occasion we shall have the benefit of his experience in that country. (Loud applause.)

The extraordinary general meeting of the company was then held.

The Chairman, in moving the adoption of the necessary resolutions, said he thought they had reason to congratulate themselves on the fact that, if the resolutions were passed, they would have a *quid pro quo* in the fact that they would have the enormous privilege and occupy the proud and almost unique position of having at that early stage of their career a quotation on the Stock Exchange lists. That they would all agree, was an excellent privilege, and one to be much desired. (Applause.)

The necessary resolutions were then unanimously agreed to as follows:—

1. That Article 44 of the Articles of Association of the Company be altered by omitting the word "one-fifth" and substituting therefor the word "one-tenth."
2. That Article 76 of the Articles of Association be altered by omitting the words "a first director," down to and including the word "Company," and substituting therefor the following words—"a first director may act before acquiring his qualifications, but shall in any case acquire the same within one month from his appointment, and unless he shall do so he shall be deemed to have agreed to take the said shares from the Company, and the same shall be allotted to him accordingly."
3. That Article 89c of the Articles of Association be altered by omitting the words "or do not acquire" down to and including the word "Company."
4. That Article 101 of the Articles of Association be altered by adding thereto the words, "and two copies of each of these documents shall at the same time be

forwarded to the Secretary of the Share and Loan Department, Stock Exchange, London."

Mr. Jonathan Packman moved a hearty vote of thanks to the Chairman for his able statement. They all joined with him in the sanguine view he took of their prospects, but there was one thing of which mention ought to be made, and that was that their operations were being carried on under the British flag. (Hear, hear.)

Mr. Halliday seconded the motion, and it was carried amidst applause. The Chairman having briefly acknowledged the compliment, the meeting terminated.

Saw-Bill Lake Gold Mining Co. The following is excerpted from a report of the Managing Director to the shareholders under date of 13th ulto.:—We now have erected an office and living camp for Manager, 14 x 10, a sleeping camp 12 x 10, kitchen 14 x 20, warehouse 15 x 15, and stabling. The timber for those buildings had to be cut and hauled from about one mile south of the location, there being no timber large enough on the ground. This of course detained us considerably. On the 27th April the buildings were all completed and two shifts of miners were started in the shaft, the dimensions of which are 7 x 10 outside the timbers, making a good, commodious double compartment shaft.

At the time of leaving the location we had reached a depth of slightly over 50 ft. from the floor of the shaft house to the bottom of the shaft, and 55 ft. from the actual starting point.

A hand windlass was used with a bucket till the 10th of June, when we discontinued work pending the erection of our shaft house and the setting up of our machinery, and since that time the hoist has been in operation and with decided success. We are now erecting a house 24 x 30 to cover the machine and boiler, and a blacksmith shop adjoining it. This engine house building will also make a very comfortable "dry" both winter and summer, for the miners, and being heated with the boiler will save the expense of another building.

The hoist is of 20 ton capacity and capable of sinking 300 ft. We have two pumps purchased from the Nor'way Manufacturing Company of Toronto; one a feed to the boiler and of sufficient capacity for fire protection, the other for a mine pump, which so far has not been needed, the mine making water only at the rate of two barrels an hour, and easily taken care of by hoisting with the bucket, thus saving considerable trouble and expense in delays.

The following mining results should be most encouraging to the company. At the point where the shaft was begun it showed a width of about 3 ft. and has gradually increased till its present showing is 5 ft. wide in the north end and over 6 ft. at the south end of the shaft, with both foot and hanging walls well defined, and the quartz showing a larger amount of free gold than on the surface, assays from which show as follows:

Hille	Free Milling Test	\$ 5.00
Hille	Free Milling Test	14 50
Billings, Duluth	Assay	35 00
Billings, Duluth	Assay	45 00
Gibbs	Assay	97 00

These assays represent average of the shaft at different depths.

The amount of ore on stock piles, the result of this work, I estimate at over 200 tons, which is over double the quantity that was estimated by Mr. Chewett in his report, and represents a large amount of work in such a short time.

It is the intention to proceed with drifting north and south at the 60 ft. level. This will begin when the shaft has reached a depth of 75 ft., when damage to the shaft timber by blasting will be avoided.

You will observe that in drifting from the 60 ft. level the vein is of such width that little or no waste material will be handled, the vein being the full width of the drift. Nothing will be handled but vein matter, which will make quite a saving over a vein about 3 ft. wide—the width thus showed on the surface. It is my opinion that while the drifting proceeds we will meet with richer ore than so far obtained from the shaft.

With the present staff of miners engaged sinking it is expected that by the end of October we will have reached a depth of considerably over 100 ft. (providing no accidents to machinery), the product from which, together with ore mined and raised from the drifts, will place a very large quantity of ore on the stock piles ready for milling, and if the present conditions as to quantity and quality continue—and I have every reason to believe they will—the results should be most satisfactory to the shareholders, as very large dividends may be expected.

Improvements in Blasting Operations in Collieries.*

By M. C. HILSEN, State College, Pa.

One of our humorists said of powder, with more truth than poetry, that in itself it is perfectly harmless, but it is the fire that makes it dangerous. This thought has been pressed home during the past few months while engaged in analyzing our own mine inspectors' reports and comparing the results with those of foreign countries. In fuse, cap, squib, lamp and pipe are the elements of danger. Fire-damp, coal-dust and air are the ever present fuel for the flame, and may be passive or active, according to the attendant circumstances which we do not fully understand. Imperfections in manufacturing, carelessness in handling and over-confidence in its use are the conditions which finally result in an explosion in which neither life nor property is spared by the devastating flame. The concomitant circumstances inducing or aggravating colliery explosions seem to elude our most vigorous search. Some of the causes are easily traced and are well known. The origin of some of the explosions is not thoroughly concealed. Many of the disasters occur under circumstances apparently mysterious and where much fire-damp did not likely exist. Some causes are still unaccountable; they baffle our closest investigations. Some seem remediable, yet they resist our greatest defensive skill, while of others their effects may be mitigated, if not actually controlled. We may dilute the inflammable gases by a copious well-directed air supply and render them innocuous. We may seclude the illuminating flames of our safety lamps. We may sprinkle and precipitate the coal-dust, and we may regulate the manner and the time of blasting. The mine inspectors, operators, and employees alike may, and do, co-operate to give effect to the regulations for the safety of the mine and the health of the employees; and yet during last year 240 lives were sacrificed in hundreds of accidents from explosion of gas. This aggregate is much smaller than has been witnessed in seven years, and compared to the total number of fatalities it is only a trifle smaller than formerly. Indeed, this comparative figure, as a matter of fact, will continue to increase rather than decrease, because with the growing intelligence and care of our miners, accidents from falls and cars do perceptibly diminish each year, and because with the increasing depth and consequent dryness of mine is

added that dreaded element of danger which has the power of propagating flame and of imparting explosive characters to a slight admixture of fire-damp with air.

The explosive material may consist of gas, of traces of fire-damp and dust, or of mixtures of air and dust alone, but whatever they be there will be no explosion, no ruinous hurricane unless and until the necessary and sufficient element, fire, be brought into contact with them. The source of the combustibles may be unknown, their composition may vary and the most patient search fail to reveal the reason for their violent behaviour, but we do not know how disastrous are the results when heated to a temperature above their point of ignition.

Fire-damp continually exudes from the coal and white damp from goaf or gob to threaten us; the former from one district there was carried out by the ventilating air currents 39,700 tons per year, and of the latter gas an average of the numerous analyses of the upcast showed 650 tons of the poisonous inflammable carbonic oxide to have been swept out of the mine atmosphere. These combined nearly equalled in aggregate calorific power the total volume of coal produced by the same colliery during the same time. But these are not our sole enemy; for while they create a condition for explosion there is always a possibility of reducing the extreme danger by a plentiful supply of air, and there is a probability of its immediate detection upon expulsion into the mine; its presence is not always necessary for the propagation of flame with explosive effects if dry coal dust is absent in the air. For the latter, in its highly comminuted and porous state, has the power of condensing upon its surface and retaining there, also absorbs oxygen from the ventilating current. A room full of such dust is actually a huge explosive cartridge of solid and gaseous combustible matter which needs but one element for its decomposition. This condition prevails in our bituminous mines. They are not regarded as gassy, and yet explosions therein involve greater areas than do those in anthracite mines which rank as the most gaseous in the world. In the latter there is comparatively little dust and a very small amount of absorbed gases to propagate the explosion. Explosions in anthracite mines are therefore comparatively local in their results. No coal mine is free from gas or coal-dust and its safety depends upon the elimination of every source of flame or fire from all its operations. Illumination we must have and that by flame, even if it is not better than the Davy or the Clanny, which gives us but one-fourth of a candle power; and this is the only form of flame permissible underground. Grant that it may be supplanted by some better illuminant for our roof. Though other sources of flame yet exist in our underground workings, all are accidental except that developed at the time of the ignition of the blasting powder employed to release the coal from its place. It is true that the amount annually employed is gradually decreasing with an increased skill and the employment of underholing machines, nevertheless we still use throughout our State 2,000 tons of black powder in the combustion of which we liberate into the mine gas, flame and sparks enough to account for many of the seemingly mysterious explosions. The importance of a closer attention to this branch of operations cannot be over-estimated. An improvement in their grade and the exercise of greater care in their use I am sure you will agree with me will procure for us a healthier and a safer condition of mine, for there will be eliminated some of the prevailing dangerous conditions with which we are fully cognizant, but with which by our present means seem to be unable to cope.

That black powder is totally unfit for use in gaseous collieries we must admit, also that the time has come when we should have the courage of our convictions and restrict its use. Long have we been familiar with the accidents from misfired shots, from premature explosions and from blown-out shots. Long have we recognized its deficiencies and continued to use it without protest, and probably the most of us have witnessed the degeneration of some grades of these disruptive agents. Why continue to accept the present order of things? Let us fulfil our mission as engineers and render still more safe the lives of those who are entrusted to our care and the property of our employers.

It was once my misfortune to have some experience in another field with one of the inferior grades of black powder containing, as a result of the active trade competition, an excess of the cheap constituents which resulted in the development upon ignition of an excessive amount of carbonic oxide. One pound of such powder projected into the mine atmosphere four ounces of this gas, sufficient to vitiate a room 20 ft wide, 5 ft high, and for a distance back from the face of 3 ft., to a poisonous degree. A human being could not live in this atmosphere. And this product, itself combustible, is in a nascent state and will ignite at a comparatively low temperature. When the heat of combustion reaches the temperature of ignition of this gas, it is exploded with the emission of a flame which becomes the nucleus of the auxiliary explosion which is so much dreaded because, while the first raises a cloud of dust, the second converts the workings into a seething mass of flame. This expands the later products of combustion and forms a new explosive zone which traverses great lengths of gangways and into vast areas of workings. This arises from the incomplete combustion of the ingredients of the blasting agents. They are either not in proper proportions or are not in mechanical intimacy. The combustible and oxidizing bodies must be perfectly resolved into their respective molecules for instantaneous combination into gaseous forms, and there must be sufficient available oxygen to burn the combustibles. These deficiencies it remains for the manufacturer to supply. In this regard it must be said that the unglazed powders are undoubtedly an improvement upon those whose grains are glazed, for they burn more quickly with the evolution of less noxious products. But even these are better and more powerfully fired by the aid of a detonator than by the treacherous, sputtering time fuse. A strong detonator with a sufficient fulminate and an electric machine for firing it are the *sine qua non* of any safe explosive. If in addition to this the powders be well rammed and tamped with a hard, non-carbonaceous material the gases would be more strongly confined and more of the evolved heat would be converted to mechanical disruptive energy. By this means both the efficiency and safety would be increased to a comparative degree. Even with these improvements in our use of powders there remains the liability to blown-out shots or the deleterious effects of the products of their combustion which have so toxic an effect upon the system.

Explosives which are capable of complete detonation, as are the nitroglycerine compounds, are safer for mining purposes, though more shattering in their effects. They emit little, if any, flame and evolve no combustible gases. Nitroglycerine has a sufficiency of oxygen in its composition for completely burning the combustible elements to carbonic acid, and at the risk of arousing criticism, I venture to commend the use of dynamite in proper charges as productive of good results, even in so brittle a material as are our coals. The deep grooves and the deeper holes which would be necessary would militate against the extended employment of dynamite in rooms as well as in rock work. It is perfectly harmless, safe to handle, easy to transport, so long as no liquid nitroglycerine exudes, and so long as it has not suffered deterioration by being stored underground or in a damp place. The risks of explosion are lessened but not eliminated by its use, and it is a gratification to notice the increasing use of dynamite in the gaseous mines of this State. I predict that the near future will witness its entire substitution for black powder.

In several countries of Europe the use of black powder has been prohibited in coal mines, and in more has its employment been restricted to districts which are regarded as absolutely safe. The number of mines embraced in the latter category is rapidly diminishing with the recognition by the operators of the amount of energy wasted in incomplete combustion of their explosives and the discovery by the officials

* Paper read before the joint meeting of the W. P. C. M. I., and the O. I. M. E., June, 1896.

of the presence of dust and gas in hitherto unsuspected places. Over 60,000,000 tons of coal were mined last year without the use of black powder, and, indeed, wherever it is prohibited almost the entire product is removed by high explosives of a class known as the "flameless explosives," and called by some the Sprengel explosives, after the inventor, Dr. A. Sprengel.

Here we have a group of mechanical mixtures of two explosive compounds properly proportioned for the necessary chemical reactions, and possessing four desirable qualities of a good powder, being solid, permanent in character, exploded by a detonator, and entirely convertible into gas. Whatever the names by which these flameless powders are known, they contemplate a mixture of a hydrocarbon combustible in a condition favorable for a rapid decomposition and an easily decomposable oxidizer that will not only develop the full energy of the explosive with a freedom from fumes of any sort other than the ordinary products of combustion, but will also be quite free from the projection of flame from the drill hole. Though there may be a variety of nitrated organic substances which will supply the fuel, and di-nitro benzol is the basis of some of them, in every case nitrate of ammonia furnishes the oxygen for supporting combustion.

The element of safety in the use of these explosives lies in the amount of heat necessary for the decomposition of the ammonia nitrate, and in the chemical reactions which are set up at the time of ignition serving thus to reduce the temperature of the gaseous products of combustion, and finally to prevent the formation of flame. It is not necessary to do aught here but to name the best known compounds belonging to this group, for you are familiar with their composition and behavior. Ammonite, bellite, roborite, and securite possess the requisites of a safe blasting agent. Safety is of greater importance to us than are its ballistic effects, and in this class of explosives we have the nearest approach to something safe for mining purposes.

This class of explosives has been examined by numerous committees and commissions, has been the subject of scientific investigations, had strong official endorsement from those who were using it in Austria, Belgium, France and Germany, and it seems a fitting time for American miners to take hold of the subject for the betterment of our mines. The powder is safe to handle, neither element will ignite by heat, flame or electricity. Compare that with the dangers coming from the careless use of black powder. Observe the possibilities of reducing the accident record from premature blasts. It is safe and rapid in action and requires a specially powerful detonator for its concussion to sufficiently divide the elements into their molecular state for quick decomposition into expansive gases. Observe how this will eliminate from our list accidents from picking out mis-fires. Again, the products of combustion are non-inflammable and non-poisonous, with a temperature of explosion as low as is compatible with rapidity of action. What a blessed relief its introduction would afford us.

True, it is not strictly flameless, but that should not debar it from favor here. That it is less liable to flame than is powder is true, as also that the constituent, common to all members of the Sprengel class—the nitrated ammonia—is deliquescent, and in absorbing moisture from the air deteriorates in quality. This may be remedied by dipping cartridges in nitrated resin or by keeping the two combustibles separate until required for use when they may be mixed in proper proportions and loaded. In this regard the safety explosives are all alike as also is the oxidizing element. So that when comparing the several members of the group with a view to selection of the best, that one will be advised which has a hydrocarbon in the most decomposable form. It has been said by an eminent authority that "the Sprengel explosives" are as far ahead of black powder as the Davy lamp surpasses the naked light." It is only a question of a short time when they will receive universal adoption. Until we have taken every possible precaution we are not absolved from the responsibility of accidents and explosions arising from the various sources of fire. At present we fall short of fulfilling the requirements which recent valued reports of eminent committees have shown to be necessary for safety. We must discard the present explosives not possessing self-extinguishing elements and substitute therefor agents which are free from the dangers specially attending the use of those explosives, and this can be done without the sacrifice of efficiency as may now readily be understood.

I concede that there do exist places in a mine the atmosphere of which is positively unsafe for any explosive. Then the fault lies with the condition in which the rooms are and if there is not a possibility of affecting a change of method of work from pillar and room to long wall, slaked lime might serve or a vigorous watering might be resorted to, though the latter to my mind has proven a delusion and a snare, so far as any evidence of beneficial results is concerned. During periods of rapid atmospheric depression blasting operations should be conducted with the greatest caution if not actually suspended. Such a suspension is practicable if the shooting is entrusted to a skilled workman. The use of central-fire cartridge and a magneto-electric battery with safety explosives would virtually remove the item of explosion accidents from the mine inspector's classification by leaving only one source of flame to endanger the mine and miners. As tending to the same end I venture to commend the installation of coal cutting machines not only on the score of the increased economy of labor and power but on the score of specializing the remaining operations involved in the removal of coal—one man having charge of the blasting operations only.

These may seem drastic measures and objections will doubtless be set up against them, but history repeats herself and the opposition will succumb to the inevitable. What has been accomplished in the installation of nitroglycerine for rock work will be effected with nitroglycerine and Sprengel explosives for coal. A sound, practical, scientific progress will have been recorded when more active measures are taken also to regulate the manufacture and use of all kinds and grades of permissible explosives. We deceive ourselves when we place entire reliance upon a copious supply of ventilating air with its consequent high velocity for the most markedly conspicuous feature of all extensive catastrophes of this nature is the fact that roads which are not haulage ways, and through which the air courses at only moderate velocities, are exempt from the effects of explosion.

If we relax our vigilance and fail to remove every possible source of flame we lull our fears to rest and are apt to pay the price later. "Eternal vigilance is the price of safety" has long been the motto of the mining engineer. There is no industry in which all engaged have so active a mutual interest as in mining, and none in which officials, employees and owners co-operate, appreciating that a safe mine is a healthy mine and a secure investment. Mining of to-day is hardly more hazardous an occupation than railroading. If the accidents are localized by employing a restrictive energy at the point of origin of the fire it will become a comparatively safe pursuit.

The Byron N. White Co. Pays Another Dividend.—At a meeting of the Byron N. White Company, held at Milwaukee this month, a dividend of 10 cents per share (\$100,000) on the capital stock was declared due and payable at the Milwaukee office on September 1st, 1896. This is the third dividend paid by this company since August last, when \$50,000 was paid. Again, in May of the present year, \$100,000 was paid, and now \$100,000 more, a total of \$250,000 in a year. It is the intention of the company to pay these dividends every three months.

GENERAL MINING NOTES.

(From our Correspondents.)

Nova Scotia.

With the end of next month (September) the fiscal mining year of this Province ends, and the compilation of that wonderful production, "The Report of the Department of Mines, Nova Scotia, 1895-1896," will be started, and we would like to say a few words on the subject, more particularly in the interest of the gold mining industry. During the last year some few of our mines have given some very consistent and handsome returns, and we would suggest that instead of the usual notice each mine gets, (of which the following is typical—"Nova Scotia Gold Mining Co., Montague: W. R. Thomas, Manager; William Collins, Underground Manager. Thirteen men employed, working on the Wolfe lead, down 160 ft., driving west. This mine was full of water at the time I was there, and the manager absent, consequently I could get very little information regarding the mine."—that an account showing the amount of quartz crushed and the average yield of gold be given, also the average number of men employed and a short and intelligent account of the method of working, and the geological formation of the district.

The notice each mine received in last year's report could serve no useful purpose whatever, whereas if our suggestion were followed with regard to the more important mines, and a short and concise account giving figures which would show the production and approximate cost of working, of the smaller mines, the report would make a very useful book to circulate amongst people who would be likely to take an interest in the industry, and would be the means of bringing much needed capital into the Province for it. We would also once again urge the miners to make a point of giving in their returns up to the end of September at the earliest possible date, in order that respective districts may have the full credit of all the gold they produce.

We would also suggest that the state of the timbering and ladder-ways be omitted from the published report; it serves no useful purpose and makes very poor reading matter.

We recently paid a visit to the Stormont district and found the 40 stamps at the Richardson in full swing. The size of the lead continues to hold out, while the workings demonstrate the formation of the lead very prettily. The shaft-house is situated on the apex of the anticlinal at the eastern end, shafts being sunk on both dips; the lead has been worked right around the eastern curve of the anticlinal, connecting the two shafts; it is therefore possible to go down the mine by the shaft on the north dip, through the workings, and come up by the shaft on the south dip.

There is very little work going on at the Country Harbor mines, both the St. John and the Antigonish mines being idle. Mr. J. C. McDonald is doing some development work and reports prospects as being favorable.

At Modstock work is being pushed forward energetically. The mine yielded 172 oz. last month.

The mine at Forrest Hill, on which Mr. J. C. McDonald has recently given up the bond, is now being worked by Mr. Sweet, of Cross Roads, Country Harbor.

Mr. F. H. Mason recently paid a visit to the Richardson mine, making a number of assays of the tailings. Mr. Mason has also made a report of the Barrachois Mine, Wine Harbor, in the interest of parties in England.

The North Brookfield mine is still keeping up its splendid record. It produced 396 oz. of gold from 470 tons of ore last month.

Mr. W. A. McKim *et al.* have been prospecting the copper deposits at French River, near Tatamagouche, Colchester County. They have taken out some 40 tons of stuff, which it is reported give assays of from 8 to 79 per cent. of copper, and it also at times contains appreciable quantities of silver and gold. Prospecting for copper has also recently been done on French River, Colchester Co.

The Barrachois mines at Wine Harbor has been returning some steady yields, although only worked in a very half-hearted way. In June this mine yielded 56 oz., and in July 72 oz., the ore averaged more than half an ounce of free milling gold to the ton.

The losses of refractory gold in the tailings is occupying the attention of several of the leading mining engineers in this Province. The general tendency of the mine owners is, however, to play a waiting game, and we are afraid very much will not be done until Mr. Libbey's plant has proved the success which we feel certain it will do. The following petition has been presented to the Government, signed by the majority of the leading mine owners in the Province. The petition had to be sent in hastily in order that it might be received before the late Premier, the Hon. W. S. Fielding, retired, and it was therefore not signed by some few people to whom it otherwise would have been sent:—

HON. W. S. FIELDING,

HALIFAX, N.S.

Provincial Secretary, Province of Nova Scotia, Halifax.

Dear Sir,—We the undersigned, all interested in the gold mining industry in Nova Scotia, respectfully ask to have the royalty of 2 per cent. removed from all gold recovered from tailings or concentrates by the chlorination process, until 1902, and in doing so we beg to bring the following facts to your notice:—

(1) The gold from which we desire to have the royalty removed is at the present time entirely lost to the Province, hence the removal of the royalty will in no way decrease the revenue. On the other hand the encouragement of the chlorination process will assist mines which are now shut down or about to be shut down to re-open, and the royalty from the free gold will increase the revenue.

(2) The chlorination process, as used in most other gold mining countries, has stood the trial of over thirty years and may be used by anyone without paying royalties to patentees. We are therefore not asking you to foster any patent or untried process.

(3) We believe that Nova Scotia is the only gold mining country with an average yield of gold in excess of 20,000 oz. per annum where the chlorination process is not used.

(4) From experiments which have been made we believe that we are well within bounds when we say that on the average not less than four pennyweights of gold is lost in the tailings for every ounce recovered in the battery. Ninety per cent. of this loss may be recovered by chlorination.

(5) Experiments have been made on Nova Scotian tailings by the chlorination process by men who are running and have run the process successfully in other parts of the world, and they have reported that the tailings are well suited to treatment by that process.

(6) The cost of concentrating and chlorinating will, we estimate, in this Province be from four to six dollars per ton of concentrates, so it will not compete with the stamp battery where the latter process is applicable, hence there is no fear of any loss to the revenue by the chlorination process supplanting the stamp battery. It is only intended that the chlorination process shall be an auxiliary to the stamp battery to recover gold which the latter is unable to do. The best experts in milling and chlorinating, in fact, almost universally recommend stamping and amalgamating on any ore before chlorinating.

(7) The cost of erecting efficient concentrators is about \$150.00 per stamp, and the chlorination plant will cost anything from \$2,000 to \$50,000, according to its capacity. Surely this deserves some Government encouragement.

We have the honor to be, dear Sir,

Your obedient servants.

(Signed) F. H. MASON.	(Signed) THE BROOKFIELD MINING ASSOCIATES.
" T. R. GUE.	" R. McDONALD.
" B. C. WILSON.	" — BIAS.
" CARIBOO CONSOLIDATED GOLD MINING CO., LTD.	" J. E. HARDMAN.
" GEO. PYKE, President of Richardson Gold Mining Co.	" GEO. W. MAYNARD.
" B. M. DAVIDSON.	" THE CANADIAN MINING INSTITUTE (B. T. A. BELL, Secretary).
" W. A. ADAMS.	" GEO. E. FRANCKLYN.
" GEO. W. STUART.	" JACK BELL.
" JAS. A. FRASEK.	" A. A. HAYWARD.
" J. D. COPPLAND.	And others
" A. DINON.	

A find of gold is reported from Langville's Lake, Lunenburg County, but no particulars are to hand at present.

Some three or four gold mining propositions are just now being entertained by English and Scotch capitalists, and it is more than likely that before the end of the present year one or two strong British companies will be operating in the Province. The properties under consideration have good records, and given good management (a feature which, we regret to say, past British companies cannot boast very much about) they may be pretty certain that good dividends will be forthcoming.

Mr. Miner T. Foster has a very fine set of samples of picked quartz from a property in which he is largely interested in Tangiers. Some very pretty samples from the Golden Group property were also on show in Halifax recently.

American capitalists are taking hold of the property owned by Miner T. Foster *et al.*, adjoining the Libbey property at North Brookfield. They have already paid several deposits and evidently intend taking over the property.

Mr. J. Askwith *et al.* have obtained a working bond on the Dunbrack property at North Brookfield which we have already described in these columns.

Ontario.

Our correspondent from Fort Francis writes:—

Active operations are still going ahead upon the Kay claim of "H 426" on Bad Vermillion Lake, where Foreman McLean has made a most interesting strike of free gold in their new pit upon No. 1 lode.

The *Nora* is the name by which mining location "K 353" will in future be known. This claim, now under partial development, contains an area of 53 acres, is traversed by two well mineralised lodes, that everywhere yield fine results by pan and mortar tests. This claim also carries the main lode of "K 244," where the Ottawa Company have proved so successful in their strike lately. The *Nora*, it is anticipated, will be operated vigorously this season.

The *Kodi Claims*, situated upon the south shore of Little Turtle Lake, continue to turn out excellent free milling ore in almost every opening so far made. Dr. Coleman, Ph.D., visited the entire series of the *Kodi* veins and was, apparently, much interested throughout—particularly in their last find, where free gold appears plentifully distributed throughout the surface outcroppings, at or near the line of contact with the schists and slates and the granites to the north. This their latest find is nearly two miles westward from their small mill and their original discoveries. Mr. *Kodi* is now in Duluth organizing a company to develop his estate.

The *Foley Mine* (Ontario Mining and Milling Co.)—A force of 35 men are employed here. Three drills sinking and drifting. A town site is being surveyed by the promoters of the new company and J. C. Foley, and the contract let for their 20-stamp mill, docks and outbuildings, while lumber from the Rainy Lake City saw-mill is being delivered there by every trip of "S.S. Maple Leaf."

At the Ferguson Camp, AL 110, AL 111, and K 223—now known as the Seine River (Ontario) Gold Mines, Ltd., recently organized in London, Eng. This property had considerable development made upon it before it appeared on the market, and as a matter of fact shows up today as a model of economical development, as well as sterling merit. Their working force is now over 30, but upon the arrival of machinery, now ordered, will be increased to at least 40 men. Their deepest shafts today exceed 60 ft., with much stripping and drifting from the first adit levels.

British Columbia.

Boundary Creek.

A few days ago the large ore deposit of the Copper was struck in the drift at the bottom of the 50 ft. shaft. Considerable interest has centered around the work on the Copper during the summer, as it has probably the greatest surface showing of any claim in the district, and the outlook for the camp, at least as regards the present, depended greatly on whether the deposit held its size and value at depth. The first 20 ft. of the shaft were in good ore, then lime was encountered and, at times more or less mixed with ore, continued to the 50 ft. level. A drift was then started to catch the ore body, and at a distance of nearly 30 ft. it was struck. The ore is now similar to that outcropping on the surface and shows considerably more copper glance. Brown hematite still continues and constitutes a large proportion of the ore. This will make the ore a very desirable one for smelting. At present the drift is in only a few feet in the ore body and its width cannot be stated. Its value, however, is assured.

On the "No. 7" the shaft is now down 80 ft., and the vein is improving considerably in appearance and value.

The Old Republic Mining Co. has suspended work on the tunnels on the "None-such," and the shaft is being continued on the "Last Chance."

T. G. Blackstock, of Toronto, was in during the last month. It is understood that on the report of his engineer, J. B. Hastings, an offer of \$20,000 was made for the "Jewel," Long Lake camp, and it was refused.

In Long Lake camp, on the "Alice," which was recently bought for a small sum, a shaft has been sunk 30 ft. and the vein is showing up extremely well. The work is being continued.

Mr. Wulfsohn, of Vancouver, for the Anglo-Western Pioneer Syndicate (Ltd.), with J. H. Clemes of London, are still continuing their examinations in the district. Until their examination is completed, nothing definite will be known as to whether they will make any investments here.

It is reported that the new strikes made on Pass Creek are, many of them, turning out extremely well, considerable native copper and copper glance being found.

Up Kettle River, 7 miles north of Rock Creek, a number of very promising ledges of high-grade galena have been recently discovered.

The town of Greenwood is rapidly growing. Some eighty buildings have been put up since spring.

In Greenwood camp development is going on on the "Gold Drop," "Snowshoe" and "Monarch."

A contract for the continuation of the Morrison shaft 50 ft. is shortly to be let. This property is owned by the Josie Mining Co. of Rosland.

On the "Denoro Granite," the south extension of the "Jewel," recent work has disclosed a remarkably fine body of ore. The quartz vein is about 4 ft. wide and just below it on the foot-wall is a 2 ft. strip of solid mineral—galena and pyrites.

Word comes from Fairview that the bonds on the "Morning Star," "Stem-winder" and "Smuggler" have been taken up. It cannot be at present learned who the parties are or the amounts of the bonds, but it is understood to be done by Coast parties for English capital. All these are promising milling properties, and if they be thoroughly prospected and worked, Fairview will know better times than it did even in the early days of the Strathyre Company.

The Cariboo, at Camp McKinney, is milling ore from its lower levels of better grade than ever. This company has been regularly paying dividends for some time past.

It is expected that the route of the Columbia and Western Railway will be definitely located this fall. Mr. Tye, the engineer for the railway, is at present making preliminary surveys in the district.

B. C. INSTITUTE OF MINING ENGINEERS.

Favorable to Federation with the Canadian Institute.—A Successful Meeting.

A successful meeting of the recently organized British Columbia Institute of Mining Engineers was held on 6th instant at Nelson, Mr. R. C. Campbell Johnston in the chair.

The question of federating with the Canadian Mining Institute was brought forward by the Secretary, and a letter from Mr. B. T. A. Bell relating to this was read. While the feeling of the meeting was on the whole favorable to uniting, it was not thought advisable to do so without thorough consideration, and on motion of Mr. Howard West, A. R. S. M., seconded by Mr. Hedley, the Secretary was instructed to lay before the Secretary of the Mining Institute the sentiment of the meeting and get all the information possible to lay before the next meeting.

It was proposed that Nanaimo should be the next place of meeting, and the second week in January was selected as the time for this, the day to be chosen by the Secretary and President.

There was some discussion with regard to what constitutes a qualified assayer or mining engineer, and while the meeting was against limiting the phrase to those who

pass a government examination as this would exclude many good practical men, it was thought that there should be some proof of their ability and experience given by those who come into the Province in future to take charge of mines or to assay, in order to keep out the frauds who constantly masquerade in new mining camps as experts.

Messrs. McConnell and McEvoy of the Geol. Survey were elected honorary members. The President delivered an address. Papers were read by Howard West, A. R. S. M., on the "Valuation of Prospects", and by the Secretary on "Mineral in Place". Considerable discussion ensued on these. These papers will appear in our next issue.

WIRE ROPES.

Practical Points for the Consideration of Engineers and Mining Students.

We are indebted to the Transactions of the British Society of Mining Students for the following interesting contributions on the subject of wire ropes:—

Round Ropes vs. Flat Ropes.*

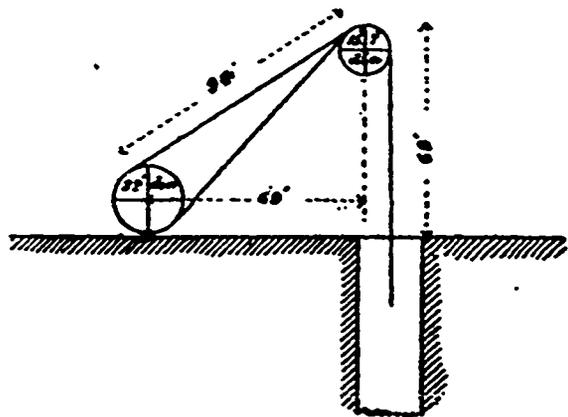
It has been for some considerable time generally admitted that the use of flat wire ropes for pit winding purposes is not only very troublesome, in consequence of the trouble entailed by the stitching breaking, and the difficulty of getting the component strands to take an equal share of the load, or to secure equal tension of the component strands and wires, but also that it is most expensive in comparison with the use of round winding ropes.

Yet there are probably many who still hesitate to make the necessary alterations, and to adopt round ropes in the place of flat ropes, possibly because of the cost entailed in the alteration of the engine, drums, and pulleys. To such it may be of service to know exactly, in one instance, what the cost per ton of coal drawn by round ropes is, in comparison with what the cost per ton by flat ropes was, working in the same shaft under the same conditions.

At a colliery that was using flat ropes, about 680 yards each, $4\frac{3}{4}$ in. by $\frac{3}{8}$ in., weighing from $5\frac{1}{2}$ to 6 tons each, and where the standard cost per ton (to which all rope-makers who were favored with the orders had to conform, by guaranteeing that that cost should not be exceeded) was 55d. for the over-lap rope and 60d. for the under-lap rope, these figures were frequently exceeded by the actual results, much to the dissatisfaction of the maker. The average life-time was about eight or nine months.

About three years ago the owners decided to adopt round ropes. They made the necessary alterations in the engine (in which the eccentrics were only 9 ft. apart) and altered the drum which was 19 ft. in diameter when working flat ropes, to 22 ft. in diameter for the round ropes, and put in new pit-head pulleys 15 ft. 7 in. in diameter on trol, which was the diameter of the old flat rope pulleys; they then put to work two ropes each $5\frac{1}{4}$ in. circumference, best plough steel, weighing from $3\frac{1}{2}$ to 4 tons each, with the result that the under-lap rope has raised 247,000 tons of coal, and on the invoice value of the rope the cost was 119d. per ton of coal (without taking into consideration the fact that they wind from 200 to 300 tons of rubbish per day), against the previous cost by flat ropes of 60d. per ton. It is therefore clear that the value saved during the life of this round rope would be the amount of difference betwixt 60d. and say 12d., equal to 48d. per ton, and this multiplied by the tonnage drawn, i.e., 247,000 gives a result of £494 saved during the life of one rope, or say £988 saving effected by the life of two ropes.

A rough diagram of the position is attached, from which it may be seen that the vertical angle at which the under-lap rope has to work is about 42° , and that for the over-lap rope 55° , and as they have a distance of about 44 inches to traverse along the



barrel of the drum, the angle from the pulley-line will be about $1^\circ 7'$ on each side. It was feared that the round ropes would not coil properly on the drum, but to avoid that they grooved the lagging, and it is satisfactory to know that it is successful, and further that it has reduced the side friction at the drum to the lowest possible degree. They wind from a depth of 530 yards, the speed being about 45 seconds, or about 24 miles an hour.

The output is about 1,300 tons per day. They wind two trams of coal each lift, the cage being double deck. The working load independent of the rope is:—

Cage, detaching hooks, bristles, caps, &c.....	5 tons.
Coal	$3\frac{1}{2}$ "
Two trams, 10 cwt. each.....	1 "
Total.....	$9\frac{1}{2}$ "

The shaft is down-cast, and free from any injurious influences.

Whereas the cost per ton by flat ropes amounted to 60d. or 001136d. per ton per yard, the cost per ton by round ropes is 12d. or 000226d. per ton per yard.

With reference to the suggestion which the writer gave in his last contribution to this Journal, and to which he is glad to see Mr. Bulman has responded by sending in

By Mr. Westgarth.

particulars and results of certain winding ropes; it is, however, a matter for regret that a greater number of the members have not done so.

The object the writer had in view in making such a suggestion was, not merely to give information about the various rope costs under a variety of working conditions, but more particularly, if possible, to get such data as would enable the Society to find out a definite figure that would represent a reasonable and fair value, or rope cost, per ton of coal per yard depth of winding.

Colliery managers very frequently may be heard to say that it is impossible to make a fair comparison with two ropes working in different pits, chiefly on account of the difference in the depth of the shafts, but if it were possible to arrive at a definite cost per ton per yard, this difficulty would disappear, and all the other conditions being usual, they would be able to ascertain what the winding-rope cost per ton for a pit of any depth should be, by multiplying the cost per ton per yard by the depth of the shaft.

The writer feels that such knowledge could hardly fail to be very useful to all mining students, &c., and if the matter is taken up thoroughly, he will be glad to carefully tabulate the various particulars that may be sent in, and endeavor to show from such actual records what a fair rope cost per ton per yard, or fathom, should be. It will therefore be apparent to all that the more data there is to work upon, the more reliable will be the resulting figure; it is therefore to be hoped that it is not yet too late for many of the members who are interested in such matters to follow Mr. Bulman's example, and send all the particulars they can, and, in doing so, it is important that they should clearly state whether the shaft is an "up" or "down-cast," and if there are any injurious influences to contend with, and also what class or type of engine is used in each case.

Wire Ropes from a User's Point of View.†

Mr. Westgarth's remarks on Wire Ropes, with a description of the Westgarth patent rope, in No. 4 of Vol. 17, are largely written from a maker's point of view; perhaps a few remarks written from a user's point of view may not be out of place.

So much has been written on Wire Ropes, that no attempt will be made to write fully concerning them, so as to avoid, if possible, going over old ground; but there are certain points upon which further information is much required.

Charcoal iron ropes, with a breaking strain of 40 tons per square inch, having disappeared, the choice of materials for ropes lies between patent crucible steel or patent improved crucible steel, with a breaking strain of 75 to 85 tons per square inch, and plough steel, with a breaking strain of 100 to 120 tons to the square inch. By using the latter, from one-fifth to one-quarter of the weight of the former rope is saved, which is a very great consideration for collieries winding large outputs out of a single shaft, unless there be a balance-rope beneath the cages. It is also often of vital importance for underground haulage, when the "leads" are long and extensions are necessary, and may prevent the putting down of supplementary haulage engines, with their attendant additional labor, or the addition of larger drums to the present engine.

The cost of plough steel is so much greater, however—the additional cost being generally about two-thirds—that, except for the above special reason, the improved steel is generally preferred.

Recently, a plough steel rope, 2 in. circumference, was put by myself on an incline with a very slight gradient, but worked but eleven months when it was replaced by a $2\frac{1}{4}$ in. circumference Lang's patent improved crucible steel rope, which appears likely to last much better.

This size of rope we generally use on our inclines and on two haulage planes. A question of much difficulty and of great importance is when should a rope be condemned. If a rope frequently breaks it is clear that there is weakness somewhere, and if after examination and cutting out the bad parts breakages still occur, it must be clear that the nature is out of the rope, and that this rope requires changing.

If the system of haulage be main and tail, this will naturally happen to the tail rope, when a new main rope must be put on, the bad part of the tail rope cut out and part of the whole of the former main rope put in the tail rope. But what is wanted is, before breakages occur, to be able to decide with certainty that the rope is too weak for its work. There appear to me to be no hard and fast rules to decide this. All can tell when a rope is worn, but where to draw the happy line is the difficulty. This is of course particularly necessary when the system of haulage is main and tail rope, or main rope only, and the train travels at a high speed. With endless ropes it is naturally not so important.

Winding ropes are never allowed to wear to any extent, and the number of broken wires generally governs the time when they are taken off, and many, as a precaution, refuse to allow a rope to remain on more than two years.

It would be useful if a number of members would state what life they obtain in actual practice from winding ropes, both flat and round, and from main ropes, main and tail, and endless haulage ropes.

Unfortunately in our case, flat winding ropes, $3\frac{1}{2}$ in. x $\frac{3}{8}$ in., are used; they are galvanized and generally wear 20 to 22 months. Few would now adopt flat ropes, as the additional weight of some one-fifth, the consequent additional cost, and the trouble caused by the stitching mean increased working cost.

The main haulage ropes on our No. 1 haulage plane, on which journeys run of 12 tubs, taring 8 cwt. and carrying 23 cwt. of coal, and when stone falls 30 cwt., and the inclination of which may average 1 in. per yard, last 14 months, being turned at the end of 7 months, and after use as a main rope worked as a tail rope.

That on our No. 2 plane lasts but 9 months. In this case the journey consists of 24 tubs, and the length of plane is 1,200 yards, or about double the other, while the average inclination is but $\frac{1}{2}$ in. or so per yard. The main rope is generally turned end for end after working $4\frac{1}{2}$ months, and used as a tail rope at the end of the 9 months.

The shorter life of this rope is probably due to a portion of the plane being wet, while the No. 1 plane is dry throughout. It has always been a question with me whether a stronger rope ought not to be used on this No. 2 plane, and whether this would not produce an increased life and be an economy.

While the winding ropes are galvanized the haulage ropes are not; yet in my opinion the No. 2 rope ought to be galvanized, and if so, should wear a longer time, if its short life is due to the plane being in part wet. The additional cost being but 5/- per cwt. this should prove an economy.

Although our planes are well rollered and the rollers and pulleys well oiled, yet there is a considerable amount of wear on the wires of the ropes, while although the ropes are always got from the same firm, and that a well-known and first-class firm, and are of the same description, yet there appears a wide difference in the hardness of the ropes, which of course means a shorter life obtained from the softer ropes. Is this a general experience? if so, how is the difficulty met?

At some collieries it is the custom of the rope-maker to guarantee a certain life for each rope, and if the life is not obtained, to compensate the firm. This appears to me to be reasonable, provided the rope is fairly used, and should meet the difficulty.

Another point upon which information would be valuable is that of oiling. While

† By Mr. G. E. J. McMurtrie, A.M.C.E.

winding ropes are generally oiled, haulage ropes in many cases are not. We regularly oil our winding ropes once per week with a mixture of tallow, tar and lampblack, rubbing it well in with long-handled brushes, while the rope is slowly lowered out or drawn in. Our haulage ropes are not oiled however, presumably for the reason that running through occasional wet and over dusty roads, although rollers are placed but 20 yards apart, the frequent slack ropes and the rubbing on the rollers would soon take the oil off, and little or no benefit would be derived, while expense would be entailed.

A great point would be gained if some simple oiling arrangement could be brought out for haulage purposes, which should combine a box through which the rope should pass, and which should be filled with a preparation of oil, together with some brushes fixed on the inner side of a revolving screw, to work the oil well in, the frames carrying the brushes being caused to revolve by the rope itself. Some means would be required, such as a pan placed underneath, to catch any oil carried through by the rope in waste, and to prevent the oil running out of the opening in the box left for the rope.

Mr. C. M. Percy describes an arrangement for oiling winding ropes, consisting of a trough formed in two pieces of timber, which loosely clam the rope. The trough is filled with waste soaked in oil, and the rope run through it. This, while a saving in labor, did not effectively oil the rope, and was abandoned.

He also describes a second arrangement for oiling winding ropes, of a pair of friction rollers which grip the rope sufficiently tight to be made to revolve by the rope. These in turn work two brushes, one of which cleans the rope while the other oils it. Whether this is a success or not is not stated.

Some easier method of splicing ropes, too, is badly required. At most collieries it is the rule to put a joint temporarily in a broken rope, and to splice it when the haulage is finished for the day. But many of the smaller collieries have to content themselves with the joints, as there is no one there capable of splicing, the fact apparently being that splicing is difficult to learn, and few trouble to learn it. So that except at large collieries with a number of haulage planes, splices are seldom made, and joints, with their attendant risk of catching against something and drawing out, are the rule.

A frequent cause of broken ropes is the running of the train at unnecessarily high speeds, with the result that the engine has to stand for a time. Knowing what can be wound, is it not wise to arrange a maximum speed or number of journeys per hour, which shall not be exceeded?

Although the amount of slack in a haulage rope is an unimportant matter, provided the engine-man starts his engine quietly and gradually puts the full strain on the rope, which ought always to be done, yet in the case of winding ropes it is most important.

In this case the engine-man cannot so nicely regulate the speed of his engine, as the steam is thrown on all at once to get up full speed as quickly as possible. The effect of this is shown by the following tables of strains published by Messrs. G. Cradock & Co. and Messrs. George Elliott & Co.

FIRST TRIAL.

	Tons.	Cwts.	Qrs.
Empty cage, resting on buntons.....	1	16	0
No. 1, Empty cage, lifted gently.....	1	16	0
No. 2, " " with 2½ in. of slack chain.....	2	10	0
No. 3, " " " 6 in. " ".....	4	0	0
No. 4, " " " 12 in. " ".....	5	10	0

SECOND TRIAL.

	Tons.	Cwts.	Qrs.
Empty tubs and cage.....	2	17	0
No. 1, Empty tubs and cage lifted gently.....	3	0	0
No. 2, " " with 3 in. of slack chain.....	5	0	0
No. 3, " " " 6 in. " ".....	5	10	0
No. 4, " " " 12 in. " ".....	7	10	0

THIRD TRIAL.

	Tons.	Cwts.	Qrs.
Cage and full tubs.....	5	1	0
No. 1, cage and full tubs, lifted gently.....	5	3	0
No. 2, " " with 3 in. of slack chain.....	8	10	0
No. 3, " " " 6 in. " ".....	10	10	0
No. 4, " " " 9 in. " ".....	12	10	0

This, no doubt, is the principal reason why ropes wear at the pick-up, and proves the great importance of reducing the slack in winding ropes to a minimum.

These are a few of the practical difficulties that users of ropes have daily to face, and the author feels that there is room for a really useful discussion on these and other points. It is in this hope that he has ventured to give his views and practice, and he trusts that other members will give theirs.

Haulage Ropes—Method of Calculating Friction.*

Early in 1893 I had occasion to ascertain the working load upon a hauling rope, and experienced considerable difficulty in obtaining a rule or formula applicable to the peculiar arrangement by which the rope worked.

The following are a few of the particulars:—

Average weight of full tub.....	14½ cwts.
No. of tubs in a set.....	28
Total weight of set, 14½ × 28.....	20 3 tons.
No. of bottom rollers.....	23
Binding sheaves.....	5
Binding down sheaves.....	2
Curve.....	10
Bell.....	1
Heaviest gradient 1 in 13½ for 305 yards.	

I had to allow, in the absence of any direct rule, for the friction on the various sheaves and rollers, square turn, and heavy drift, down which the rope worked to reach the bottom seam. This allowance I put down as:—

Full lead.....	406 cwts.
Say ¾ for friction.....	4·95 "
	410·95 "
Say friction on roller sheaves, etc.....	1·22 "
Total.....	412·17 "
Heaviest gradient 1 in 13.....	1/3 of 412·17 = 31·7 "

Working from these details, and taking the average of three authorities and sundry rope-makers' approximate rules, the working load worked out to 29 cwts. I was not satisfied with these results, and determined to obtain, if possible, some direct information upon the point by asking the question through the columns of the *Practical Engineer*. I was successful, and thinking the information might be useful to other members of this Association, my friend, Mr. F. Eastmead, of 39 Victoria street, Westminster, gave me, most cordially, permission to publish in the Journal the calculations he made for me. I may say here that he had made several experiments to ascertain the friction ropes would have to overcome in travelling round sundry pulleys necessary to work the hydraulic lift in the Blackpool Tower, which he erected.

The following is the paper he so kindly sent me:—

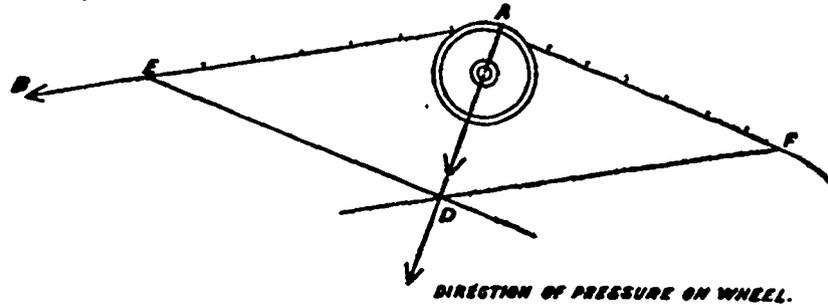
The loss of work due to the friction of the spindle is found by multiplying the pressure on the wheel **P** by the coefficient of friction—**U**.

Thus, loss = **P** × **U**.

The equivalent pull on ropes is found by dividing this by the ratio between the pulley diameter and spindle diameter.

This extra pull on rope due to friction = $\frac{P \times U}{\text{ratio}}$

The pressure on wheel is found as follows:—



Set out **AB** and **AC** representing the angle made by the rope. Mark off **AE** and **AF** to any scale, say 1-in. = 1 ton, representing the pull on the rope. Draw **FD** parallel to **AE**, and **ED** parallel to **AF**; then **AD** represents to the same scale the pressure on pulley (add to this the weight of wheel itself, when spindle is horizontal).

The loss of work due to bending a rope round a pulley may be taken, if the rope bends half round the pulley, thus:—(see sketch below) to be 15 lbs. for every ton load in each end of the rope; if **P** and **P** be each 1 ton, a weight of 15 lbs. must be added to **P** to make it go round (neglecting spindle friction).

I allow a factor of safety, myself, of 10 to 1 for ropes (direct winding) and make the pulley diameter = 19 times the circumference of rope.

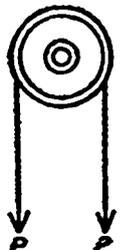
(A) The coefficient of friction **U** is taken as 1/5 of the pressure on spindle.

28 coal-tubs at 14½ cwts. = 406 cwts. = 20·3 tons.
Assumed weight of rope..... 4 "

$\frac{406 \times 1}{19} = 21·4$

So, for calculation we shall take pull on rope to be—

$\frac{20·7}{13} = 1·59$ tons, or 3,560 lbs.



(B) We may assume that the rope lies on the 50 bottom rollers with just pressure enough to drive them; in this case there is no loss from bending the rope, but assuming weight of roller to be 56 lbs., we may take the pressure on the spindle to be 60 lbs.

Ratio of roller diameter to spindle diameter = $\frac{7·5}{6} = 1·25 : 1$

Extra pull on rope due to friction = $50 \left(\frac{60 \times 1·15}{1·25} \right) = 360$ lbs.

(H) The 6 drum sheaves have a pressure of, say:—

Pull on rope × 1 = 1·59 tons = 356 lbs.

Ratio of drum diameter to spindle diameter = $\frac{17}{1·75} = 9·7 : 1$

Extra pull on rope = $6 \left(\frac{356 \times 1·15}{9·7} \right) = 33$ lbs.

(I) Upright sheave. Pressure, say = same as H = 356 lbs.

Ratio = $\frac{8}{1·5} = 5·33 : 1$

Extra pull on rope = $\frac{356 \times 1·15}{5·33} = 10$ lbs.

(C) Pressure = say pull on rope × 2·7 = 356 × 2·7 = 960 lbs.

Ratio = $\frac{46}{2·5} = 18·4 : 1$

Extra pull on rope = $\frac{960 \times 1·15}{18·4} = 7·84$ lbs.

(D) Pressure = 3560 × 1·41 = 5040 lbs.

Ratio = $\frac{46}{2·5} = 18·4 : 1$

Extra pull on rope = $\frac{5040 \times 1·15}{18·4} = 41$ lbs.

(G) Pressure = same as D = 5040 lbs.

* By Mr. C. F. Scott.

$$\text{Ratio} = \frac{34}{2.5} = 13.6 : 1$$

$$\text{Extra pull on rope} = \frac{5040 \times .15}{13.6} = 55.6 \text{ lbs.}$$

(F) Pressure = load \times .27 = 3360 \times .27 = 960 lbs.

$$\text{Ratio} = \frac{28}{2.5} = 11.2 : 1$$

$$\text{Extra pull on rope} = \frac{960 \times .15}{11.2} = 12.85 \text{ lbs.}$$

(E) Load same as F = 960 lbs.

$$\text{Ratio} = \frac{64}{3.5} = 18.3 : 1$$

$$\text{Extra pull on rope} = \frac{960 \times .15}{18.3} = \text{say } 8 \text{ lbs.}$$

Frictional losses deducted to their equivalent pull on rope:—

360.00
33.00
10.00
7.84
4.00
55.60
12.85
8.00

Weight of tubs 3560.00

4088.29 lbs. = 1.83 tons.

Loss Due to Bending Ropes.

If we take the work done in bending the ropes partially round the sheaves in the system as equal to bending half round three sheaves, we shall be about right.

$$\text{Load on ropes} = 1.83 \text{ tons.}$$

$$\text{Loss at 15 lbs. per ton} = 3 \left(\frac{1.83 \times 15}{2240} \right) = 3 (.122) = .366 \text{ tons; say } .4$$

$$\text{So total load on rope} = \begin{cases} 1.83 \\ .04 \\ \hline 1.87 \text{ tons.} \end{cases}$$

Breaking strain for machine winding should be seven times working load = 13.09 tons, say a 2 in. patent steel rope by Cradock, which gives 14.5 tons.

The result shows the weight I assumed for the rope to be too great; 16 tons would be nearer the mark. This, however, will make very little difference to the ultimate result.

The following are the formulæ for a rope passing over a pit-head winding pulley:—

- Let **w** = weight of cage and tubs in tons.
- " **W** = " " rope
- " **fr** = frictional loss in spindle "
- " **fb** = loss due to bending rope "
- " **R** = ratio between pulley diameter and spindle diameter.

Then—

$$fr = \frac{2(w+W) \times .15}{R} = \frac{3(w+W)}{R} \dots (1)$$

$$fb = w+W + fr \times \frac{15}{2240} \dots (2)$$

or, putting in the value of "fr" just found in (1)

$$= w+W + \frac{3(w+W)}{R} \times \frac{15}{2240} \dots (3)$$

$$\text{So pull on rope on engine side of pulley} = w+W + fr + fb$$

$$\text{If there is a binding pulley at the bottom also—pull} = w+W + 1.75(fr+fb)$$

Take the load to be lifted plus an assumed weight of rope. The load on pulley spindle will be twice this so calculate the frictional loss as shown at beginning of this paper. Then add this frictional loss (or "extra pull" due to friction) to the loads (cage, &c., and ropes). This will give you the pull on the engine side of the pit-head pulley. Then for each ton of this pull, add 15 lbs., which is "extra pull" due to the stiffness of the rope, and you have the total pull on rope.

For direct winding you should take a rope giving a breaking strain ten times this load.

Putting this concisely we have:—

$$\text{Pull on Rope} = \text{cage and tubs} + \text{rope} + \text{frictional loss} + \text{loss due to bending.}$$

$$\text{Frictional loss reduced to a pull on rope:—}$$

$$\frac{2(\text{cage and tubs} + \text{rope}) \times .15}{\text{Ratio}}$$

Loss due to bending:—
(This comes out in tons)

$$\frac{\text{Cage and tubs} + \text{rope} + \text{frictional loss} \times \frac{15}{2240} \text{ tons.}}{(\text{in tons}) \quad (\text{in tons}) \quad (\text{in tons})}$$

If there is a binding sheave at the bottom too,

$$\text{Pull on Rope} = \text{Cage and tubs} + \text{rope} + 1.75(\text{frictional loss} + \text{loss due to bending}).$$

It will be seen that Mr. Eastmead's total load on rope is much higher than mine; this will be accounted for by his—

Assumed weight of rope being higher in A equation.
50 bottom rollers against my 23, and the assumed weight of each at 56 lbs., whereas the actual weight is 18 lbs. in B "

These differences are, however, of no moment, as it is not for accuracy of figures, but rather for the value of the equations that Mr. Eastmead's paper is useful.

MINING NOTES.

Quebec.

At the pits of the Bell's Asbestos Company, Thetford Mines, about 300 persons are employed, and the output for the year, it is estimated, will be larger than at any previous period in the history of the company.

A large quantity of asbestos has been won this season from the Jeffrey mine, where many improvements in machinery and equipment have been made by the Danville Asbestos and Slate Co.

In our last issue it was stated in error that Mr. W. T. Costigan had assumed the management of the property of the Glasgow and Montreal Asbestos Co. at Black Lake. Mr. James Costigan, B.A. Sc., a son of Mr. W. T. Costigan, has the work in hand, assisted by our old-time friend, Mr. A. M. Evans. A cyclone mill has been added to the plant to work over the old dumps.

Several important shipments of chromic iron have recently been made to the United States from the mines at Black Lake.

Mr. John Hardman continues operations on his alluvial property at Slate Creek, the work being carried on in his absence under the superintendence of Capt. Macduff, a miner of large experience in Australia and Nova Scotia.

There is nothing noteworthy to report from the mica mines, at some of which a good deal of activity is noticeable. The old Blackburn mine in Templeton employs about 30 persons, and the Wallingford and McLaurin mines, in the same district, are also active. A steady demand continues for scrap mica and several sales of importance have been concluded, the principal purchaser being the Mica Boiler Covering Co. of Toronto.

Mr. John Penhale is doing some asbestos mining at Broughton, Que., for the United Asbestos Co., Ltd., of London.

The following are the mineral exports from the port of Ottawa as per Customs manifests for the seven months ended 31st July:—

Mica	292,334 lbs.,	of a value of \$30,913
Graphite	164,300 "	" 6,183

NEW COMPANIES.

Manitou Gold Mining Co.—Incorporated under Ontario statutes. Capital, \$500,000. Head office Toronto. Formed to carry on mining in the district of Algoma, Rainy Lake and Lake of the Woods. Directors: Simeon H. Janes, W. H. Cawthre and Edmund Bristol, all of Toronto.

Coolgardie Mining Co.—Capital \$700,000. W. W. D. Turner, President; J. L. McCulloch, Vice President; L. F. Williams, Sec. Treas. Spokane Wash. Formed to acquire and work mining property at Copper Camp, Boundary Creek, British Columbia. It is stated 1000 tons of ore are on the dump awaiting shipment sampling \$27 in gold, silver and copper.

Lake Erie Oil and Gas Co.—Under Ontario statutes. Capital \$45,000. Directors: A. M. McIntyre, James Poole, D. C. Clay, Colin S. Leitch, all of Dutton Ont. Operations of the company are to be carried on in the townships of Aldborough, Dunwich, Southwold, and the village of Dutton, where the head office of the company is to be situated.

Gold King Mining and Milling Co., Ltd.—Under New Brunswick statutes. Capital \$500,000. Head office: Fairville, parish of Lancaster, N. B. Directors: E. G. Evans, Hampton, N. B., E. C. Elkin, St. John, C. P. Baily, St. John, Mark Gallerd, Waterville, Maine, C. J. Wasson, St. John.

Gold King Mining Co.—Chief place of business, Rossland, B.C. Authorized capital \$1,000,000. Directors: T. S. Gilmour, Rossland, C. R. Hamilton, Rossland, and A. D. Provand, London, Eng. Formed to acquire and work the Gold King mineral claim in the Trail mining division, B. C.

Pacific Coast Portland Cement Co. has been formed to take over as a going concern the cement works of the Canadian Pacific Railway Co. on Vancouver Island, B. C., to purchase the property of the Saanich Lime Co. situated on Tod inlet, containing 435 acres, and to carry on the business of quarrymen and manufacturers of Portland cement. Head office Vancouver. Capital \$500,000.

Eastern Star Gold Mining Co.—Head office Spokane, Wash. Capital \$500,000. Formed to carry on mining in British Columbia.

Independent Mining Co.—B. C. statutes. Capital \$1,000,000. Head office: New Westminster, B. C. Directors: J. B. Kennedy, Louis Williams, and H. L. De Beck, all of New Westminster, B. C.

Randolph Gold Mining Co.—Head office: Spokane, Wash. Capital \$750,000. To carry on mining in B. C.

Dellia Mining and Milling Co.—Head office: Spokane, Wash. Capital \$750,000. To carry on mining in B. C.

Golden Cache Mines.—Head office Vancouver, B. C. Capital \$500,000. Formed to acquire by purchase or otherwise, the mineral claims known as the "Golden Eagle," "North Star," "Golden Stripe," "Ruby," and "Jumbo," situate in the Lillooet District, from the present owners thereof, either for money or fully paid up shares of the company.

Ivanhoe Gold Mining Co.—Head office: Rossland, B. C. Capital \$1,000,000. Directors: D. W. Higgins, Duncan Campbell, A. M. Whiteside, J. F. Travers, J. H. Adams, C. O. Redin, and C. F. Jackson of the town of Rossland, B. C.

C. & C. Mining Co., Ltd.—Head office: Rossland, B. C. Capital \$500,000. Directors: M. M. Campbell, Vancouver, J. H. O'Leary, Rossland, and D. G. Marshall, Vancouver. Formed to carry on mining in British Columbia.

British Lion Mining and Milling Co.—Head office: Rossland, B. C. Capital \$600,000. Directors: John Kirkup, W. G. Ellis, G. A. Fraser, and Wm. Stables, all of Rossland, B. C.

Deer Park Mining Co.—Registered 24th July. Head office: Spokane, Wash. Capital, \$1,000,000. Formed to carry on mining in British Columbia.

B. C. Gold Mining Co., Ltd. has been formed to adopt and carry into effect, with or without modifications, an agreement dated the sixth day of July, A. D. 1896, and made between the said F. S. Timberlake, S. I. Timberlake, and H. Heffering, of the one part, and Adolphus Williams, on behalf of the Company, of the other part: to acquire mining property and to carry on mining in British Columbia. Capital \$1,000,000. Head office: Vancouver, B. C. Directors: F. S. Timberlake, L. B. Hesse, and H. Heffering.

Little Jumbo Gold Mining Co.—Registered 28th July. Head office: Seattle, Wash. Capital \$650,000. Formed to carry on mining in British Columbia.

Hinckley and Black Colt Mining Co., Ltd. has been formed to purchase the Hinckley and Black Colt mineral claims, situated in the Slokan district and New Denver mining division, in the district of West Kootenay, British Columbia, and any other mineral claims in the said Camp, or elsewhere in the province of British Columbia, and pay for the same either in money or fully paid up shares of the Company, and to prospect, work, explore, develop, and turn to account the said mineral claims. Capital \$1,000,000. Head office: Kaslo, B. C. Directors: J. B. McArthur, P. Porter, R. Shea, W. H. Mellick, Horace Thorne.

West Wellington Coal Company.—Head office: Vancouver. Authorized capital, \$500,000. Directors: Edward H. Heaps, W. Goode Johnson, and David E. Marshall, all of Vancouver, B. C. Formed to purchase the coal property known as the West Wellington Coal Mine, lately owned and operated by Mr. D. Jordan, and also to buy, sell or lease other coal lands in British Columbia; prospect for coal with diamond drills or otherwise; open up and operate coal mines; build roads, bridges, tramways, wharves, bunkers, erect houses and other buildings; buy, sell, lease, erect, and operate machinery, mills or manufactories; buy, build, charter and run steamers, barges or scows; and generally to carry on any other business whatsoever which the company may desire or may consider capable of being conveniently carried on in connection with any of the before mentioned businesses; also with power to amalgamate with any other company or companies, and establish agencies abroad.

Bondholder Mining Co., Ltd.—Head office: Vancouver. Authorized capital, \$1,000,000. Directors: E. P. Davis, R. G. Tatlow, and C. T. Dunlar, all of Vancouver, B. C. Formed to acquire, by purchase or otherwise, the mineral claims known as the Bondholder, Pine Log, Lone Star, and Rosebud, situate between Springer and Ten Mile Creeks, in the Slokan division of West Kootenay, from the present owners thereof, either for money or fully paid up shares of the company, and to carry on the business of mining.

Rossland Red Mountain Gold Mining Co.—Head office: Spokane, Wash. Capital, \$1,000,000. Formed to mine in the Trail district, B. C.

Cariboo Mining and Development Co.—Head office: Seattle, Wash. Capital, \$300,000. To carry on mining in British Columbia.

Rob Roy Gold Mining Co.—Head office: Spokane, Wash. Capital, \$500,000. To mine in British Columbia.

Quesnelle and Cariboo Gold Fields Exploration Syndicate.—Head office: Hantshead Chambers, Sheffield, England. Registered 24th July. Authorized capital, £12,000 sig., in shares of £50. Formed to carry on mining in the neighborhood of the mouth of Quesnelle River, B. C., and to purchase or otherwise acquire, and to sell, dispose of and deal with mines and mining rights of all kinds and undertakings connected therewith, and in particular the mining license, dated the 6th day of June, 1895, granted to Mr Charles Frederick Law, of Vancouver, Mining Engineer, under the provisions of the before mentioned Act, and the lease which may be granted under that Act.

Rainy Day Gold Mining Co., Ltd.—Head office: Rossland, B. C. Capital, \$600,000. Directors: John A. Kirk, J. B. Chantrell, H. E. A. Courtenay, and H. S. Jones, all of Rossland, B. C. Formed to purchase the Rainy Day Mineral Claim, situate in the Trail Creek mining division of West Kootenay district, British Columbia, and any other mineral claims in the said district or elsewhere in the Province of British Columbia, and pay for the same either in money or fully paid up shares of the company, and to prospect, work, explore, develop, and turn to account the said mineral claims.

Alhambra Gold and Copper Mining Co., Ltd.—Head office: Victoria, B. C. Capital, \$600,000. Directors: Thornton Fell, R. T. Cooper, R. H. McMullen, H. G. Hall, and R. T. Williams. Formed to purchase the "Francis I." and the "Major," mineral claims situate on Morning Mountain, near Nelson, in West Kootenay district, and to prospect, work, develop and turn to account the said mineral claims.

The Channe Mining Co.—Head office: Vancouver, B. C. Capital, \$1,000,000. Directors: P. N. Smith, Joseph Sheasgreen, G. W. Willis, Gordon Drysdale, and A. C. Brydone-Jack. Formed to carry on mining in British Columbia.

Fairview Gold Mining Co.—Head office: Seattle, Wash. Capital, \$1,000,000. To mine in British Columbia.

Morning Glory Mining Co.—Head office: Vernon, B. C. Capital, \$500,000. Directors: A. E. Morden, J. N. Morden, and J. E. Morden. Formed to take over and acquire mining leases or mining claims, or any other mining property in any part of the Province of British Columbia, and in particular to acquire from the owners thereof the mineral claim "Morning Glory," situate on the east side of Okanagan Lake, district of Yale, British Columbia, and pay for the same either in money or fully paid up shares of the company, and to prospect, explore, develop, and turn to account the said mineral claims.

Butte Gold-Copper Mining Co.—Head office: Spokane, Wash. Capital, \$1,000,000. To mine in British Columbia.

Columbia Mining Co. of Victoria, B. C.—Head office: Victoria, B. C.

Capital, \$100,000. Directors: J. C. Davie, B. W. Pearse, A. P. Luxton, F. B. Pemberton, and A. C. Flumerfelt, all of Victoria, B. C. To carry on mining in British Columbia.

Pittsburg Gold Mining Co.—Head office: Rossland, B. C. Capital, \$750,000. Directors: F. T. Schooley, A. B. Clabon, John McLaren, W. R. Hall, M. J. Brown, R. Thornton, David McBeath, and T. H. Armstrong. Formed to purchase the "Pittsburg No. 1" and the "Yellow Copper" mineral claims situate in Trail Creek mining division of West Kootenay district, and to prospect, work, develop and turn to account the said mineral claims.

Kootenay-London Mining Co.—Head office: Rossland, B. C. Capital, \$1,000,000. Directors: G. Pritchard, W. Bennison, W. A. Campbell, A. J. McMillan, J. W. Cover, C. O. Lalonde, J. S. Paterson, H. Kitley and J. W. Boyd. Formed to purchase the "Comet No. 2," and "Annie" (fraction) mineral claims, situate on Red Mountain, in Trail Creek mining division of West Kootenay district, and to prospect, work, develop, and turn to account the said mineral claims.

Ontario Gold Co.—Head office: Spokane, Wash. Capital \$1,000,000. Formed to mine in B. C.

Queen Gold and Silver Mining Co.—Head office: Vancouver, B. C. Capital \$500,000. Directors: Wm. Teague, Benjamin Douglas, and John McQuillan. Formed to mine in B. C.

Emu Mining Syndicate Ltd.—Head office in England. Capital £10,000. To mine in B. C.

Green Crown Mining and Milling Co.—Head office: Spokane. Capital \$1,000,000. To mine in B. C.

Alliance Prospecting Syndicate of B. C.—Head office: Vancouver. Directors: H. Bell-Irving, Duncan Bell-Irving, and Henry Clyne. Formed to acquire mineral lands and to carry on mining in B. C.

Red Mountain View Gold Mining Co.—Capital \$1,000,000. Head office: Rossland, B. C. Directors: W. G. Johnson, Judge Spinks, I. N. Campbell. To purchase the "View" claim, Trail Creek district, B. C.

The Pioneer Development and Exploration Co. of B. C.—Registered in London, England, 17 June. Capital £150,000 sig. Formed to adopt and carry into effect an agreement made between Charles Tetley of Vancouver, B. C., of the first part, and this company of the other part, and also an agreement expressed to be made between the Kootenay Promotion Syndicate Limited, of the one part and the company of the other part, to seek for and secure openings for the employment of capital in British Columbia; to acquire mines, mining rights, etc.; and to develop, deal with and generally turn to account the same in such manner as the company shall see fit; and further to acquire any mines, mining, water and other rights, grants, leases, claims, concessions, options of purchase, metalliferous land, alluvial ground, mineral deposits, etc., in any part of the world and to carry on the business of a mining, milling, smelting and metallurgical company in all or any of its branches; to lay out towns and villages and to promote immigration thereto; to construct, maintain and work rail and tram roads, docks, piers, wharves, warehouses, etc.; to develop the resources of such lands as may from time to time be acquired by the company by clearing, draining, planting, farming or building thereon etc.

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Eric Gold Mining Co., Ltd.—Head office: Rossland, B. C. Capital \$1,000,000. Directors: F. W. Rolt, E. Bowers, James Hunter, W. H. Lancaster, and W. A. Campbell. Formed to take over and acquire in any lawful manner mining leases or mining claims, or mines held as real estate, or any other mining property in any part of the province of British Columbia or elsewhere (including the Eric mineral claim, situate on Monte Christo mountain, near Rossland, B. C.), and to pay for the same either in cash or fully paid up stock of the Company, or bonds, shares, stock and securities of this and any other company or corporation.

Young British American Gold Mining Co.—Head office: Rossland, B. C. Authorized capital, \$10,000,000. Directors: Howard C. Walters, R. C. Pollett and Jos. H. Adams. To carry on mining in British Columbia.

Phoenix Consolidated Mining Co., Ltd.—Head office: Sandon, B. C. Directors: John D. Farrell, J. E. Poupore, M. W. Bruner, G. McL. Brown and Jas. Burridge. Capital, \$750,000. Formed to purchase the Phoenix, Libby R. and Alhambra mineral claims, situate on the north fork of Carpenter Creek, in the Slokan mining division, in the said County of Kootenay, and any other mineral claims in the said mining division or elsewhere in the Province of British Columbia, and pay for the same either in money or fully paid-up shares of the company, and to prospect, work, explore, develop and turn to account the said mineral claims.

Pacific Consolidated Mining Co.—Head office: Victoria, B. C. Capital, \$500,000. Directors: G. M. Perdue, Josiah Hemans, and C. N. Gowen. Formed to acquire the mineral claims situate within the Alberni mining division of Alberni district, on Vancouver Island, and known as the "Minerva Casad" and "Happy Day" mineral claims, and to pay for the same either with money or with fully paid-up shares in the company.

Silver Belle Mining Co.—Head office: Rossland, B. C. Capital, \$1,000,000. Directors: E. A. Pounder, J. J. Henager, and Milton O. Tibbits. To mine in B. C.

Two Friends Mining Co.—Head office: Vancouver, B. C. Capital, \$750,000. Directors: E. E. Evans, F. C. Innes, C. T. Dunlar, and Osborne Plunkett. Formed to acquire mining leases, mineral claims, or any other mining property, or any interest or interests of any nature whatsoever in mining leases, mining claims or any other mining property in any part of the Province of British Columbia, or elsewhere, and in particular to acquire the mineral claim "Two Friends," situate on Springer Creek, Slokan mining district, British Columbia.

Preston Gold Mining Co. of Seine River, Ltd.—Head office: Rat Portage, Ont. Capital, \$50,000. Directors: Wm. Blackwood, Winnipeg; W. A. Preston, Mines Centre, Ont.; Dr. A. H. Simpson, Winnipeg. Formed to carry on mining in the district of Rainy River, Ont.

New Plant for the Foley Mine.—Mr. R. E. Kerr, Fraser & Chalmer's millwright, is now at this (Rainy River) mine laying foundations and getting out timbers for the new 20-stamp mill. A cyanide plant is also to be put up. A saw-mill of a daily capacity of 15,000 ft. of lumber, hoisting engine, pumps and six air-drills have also been added. Forty persons are employed.

Graphite Mill at Ottawa.—The experimental plant of the Ontario Graphite Co. is now running on mineral from the Black Donald Mine, and, if satisfactory, the capacity will be increased to 15 ton per day.

MINING IN BRITISH COLUMBIA—NOTES FROM TRAIL CREEK.

The following was received from our correspondent too late for insertion in our Mining Notes:—

ROSSLAND, B.C., Aug. 18, 1896.—These are the halcyon days in the Trail Creek camp. The intense heat of July has been so moderated by gentle breezes and welcome thunderstorms, that life once more is worth living. These are the dog-days, but notwithstanding the whole camp is a living panorama of mining and business activity. There are more men working in the mines than at any time in the history of the camp. There are more people here than at any time previously—people with money looking for openings in one of the many avenues of business of a great mining camp, or looking for investments in the mineral belt. The installation of new machinery is of daily occurrence, and orders for additional power plants are being made. The diamond drill is gaining its place as the cheapest and best mode of thoroughly prospecting the veins of this district. The different mines and prospects have never presented such a wonderful and encouraging appearance.

The Le Roi is developing wonderfully and the increase of ore actually in sight in this mine is hardly less than marvellous. Rapid progress is being made in the sinking of the main shaft and it is now almost down to the 500 ft. level. The ore that is being taken from this shaft is a very fine-grained chalcopryite and shows little or no gangue matter. It is also of the best value yet taken from the mine.

A flume, high up on the side of Red Mountain, has been built from a point on Little Sheep Creek, near the Jumbo, to the shaft-house at the Le Roi. This will obviate the necessity of pumping water for mine purposes from Centre Star Creek. The tramway and smelter people are hauling ore by night and day from the mine, but as yet there is no very noticeable decrease in the big ore pile.

The old reliable War Eagle is producing ore right along, and is daily shipping about 30 tons to the Trail smelter. This ore is being taken out of tunnel No. 2, and the grade at this level is said to be even better than that found in the level above. A remarkable fact that has come to light lately is that the dumps, supposedly second class, proved on careful sample and assay to yield high returns in gold, and can be shipped at the present moment and yield a handsome profit.

Development work is going on rapidly at the Iron Mask, and all work done goes to show that this, for the amount of work done, is entitled to rank with the War Eagle. A shaft house has been built at a point on the saw-mill waggon road, and a first-class hoist, capable of sinking to the 500 ft. level, has been installed and is in operation. This shaft, down 40 ft., which will in time be the main workings of both the War Eagle and Iron Mask mines, has one of the prettiest showings imaginable at the bottom, there being a bottom full of high-grade gold-copper ore.

At the Josie everything is running smoothly and rapidly. The main shaft is now down about 83 ft, and shows 4 ft. of high-grade ore at the bottom. The shaft on the north vein also has a nice body of ore. The face of the main tunnel is also in ore, but it is not solid. The prettiest showing on the property, however, is in the old Poorman tunnel, where the Josie Company put a power drill to work where it entered their ground. The ore in this shaft is the full width of the tunnel, and a carload of ore is being shipped daily from this opening alone. It is of the same grade that has made the name of the Josie famous in the past.

Development work during the last few weeks has lifted the Nickel Plate from the "prospect" class into a mine of magnificent proportions. The mine is being thoroughly opened up between the 100 ft. level and the surface by means of raises and drifts, and everything is being gotten ready for the rapid stoping of ore. The Nickel Plate management have just let a contract for the immediate installation of a first-class hoist, boiler and sinking pump. Work will also be resumed on the shaft when this plant is in position. A. W. McCune, the principal owner and manager of the property, is expected to arrive in Rossland this evening, when it is reported that he will put a diamond drill to work prospecting the ground east of the No. 2 shaft.

The Centre Star mine shut down on Saturday, and will probably remain idle for a period of 10 days. The reason of the lay-off is that the 2 in. pipes did not carry sufficient air from the compressor to give the power necessary to run the drills. These pipes are being taken out and replaced by 4 in. steel pipes, which will be laid into the face of the drift. This work will be finished in a week.

The three-drill prospecting compressor recently ordered by the Lilloet, Cariboo and Fraser River Gold Fields Company, the owners of the "City of Spokane," is in place and running, and this, too, before the engine-house has been built. A house is rapidly going up, being built around the operating compressor. Trail Creek is a great camp, and companies have no time to lose in the rapid development of their properties. This company will also start a shaft for the deeper development of the mine. The showing in the tunnel is all that can be desired.

The engine-house for the reception of the new seven-drill compressor at the Monte Cristo has been finished, the cement-bed for the compressor laid and the compressor is daily arriving on the instalment plan from Trail. It will be in operation by the first of September. The men at work in the lower tunnel have been laid off and work will not be resumed here until air drills have been installed. The showing in the shaft is first-rate, and the management of the property say that the ore is obtaining a higher gold value as depth is attained. This is the general rule of the camp.

The strike recently made on the Georgia is improving, and it is the confident opinion of mining men that this claim will be second to none on Monte Cristo mountain, the locations on which mountain have been the most prolific source of rich strikes and genuine surprises of late.

The diamond drill on the Iron Horse is still in operation, and has cut through several stringers of good ore. The drill is supposed to be yet some distance from the main vein.

The new 200-tons daily capacity blast furnace at the Trail smelter will in all

probability be in operation by the end of the week. It has several novel and entirely new features. This new furnace will more than double the present capacity of the smelter.

The cross-cut tunnel on the Evening Star struck the ledge yesterday at a distance in of 147 ft. It will not be known for a few days yet how great is the full extent of the ore bodies, but so far the vein appears to be strong and regular. This tunnel will give a vertical depth of 69 ft. in the vein. A shaft for air purposes is being sunk to meet the tunnel and a raise will be started in a few days. The showing of the ore recently found in the old Cronan tunnel has widened out to 12 ft. and assays are reported high. There are about 75 tons of ore on the dump already. It is not the intention of the company to ship at present.

The shaft on the C. & C., which adjoins the Evening Star, and which is presumably on the same ledge, is developing nicely. At a depth of over 50 ft. the bottom of the shaft still presents a solid face of the arsenical ore that created so much excitement when it was first discovered. The assay returns on this ore show it to be pay rock.

At the Silverine the main shaft has been sunk past the 100 ft. level, and the vein still carries it great strength. Both hanging and foot-walls are regular and in place. The showing of the ore at the bottom is about 3 ft. A contract has been let to sink the shaft to a depth of 200 ft.

Reorganization of the Homestake Company having taken place, the local managers of the company are preparing to proceed with regular and active development work at once. Men will be put to work the first of next week getting things in place for the resumption of operations. It is not the intention of the company to do a great deal of work until the installation of the power plant, an order for which will be placed with the local agent of a big machinery company.

Notwithstanding the fact that machinery has been ordered for the Lily May, the owners of the property are busily engaged in sinking the shaft, which is now down 114 ft., by hand. The showing at the bottom is first-class and the increased gold value of the ore as depth is attained is a source of much gratification to the management. Drifts are being run each way on the vein at a depth of 100 ft. A road to connect the mine with the Trail Creek tramway has been built, and shipments of ore will soon start to the local smelter. Eleven men are constantly employed at the mine.

The shaft on the Commander has also been sunk past the 100 ft. mark and the bottom of the shaft continued in a chute of the solid auriferous chalcopryite ore which has made this claim famous. The work of exploiting the vein on both sides of the shaft will not commence until the compressor which was recently ordered is in operation. The specifications for this machinery have been received and men are at work clearing a site and laying a cement-bed so that everything will be in readiness for the reception and rapid installation of the compressor on its arrival. It should be in operation by the first day of September.

Martin King, the general manager of the Trail Mining Company, who owns the Kootenay and Columbia, is confident that the big 30-drill Cross Corliss compressor will be in operation by the first of September. This company has been seriously hampered by aggravating delays in the arrival of supplies. However, these obstacles have been surmounted and rapid work from now on will be the order of the day. Enough development work was done on these properties last year to demonstrate them mines of promise. A contract, it is believed, has been closed with the Hall mines at Nelson for the output of these mines. The Hall mines people are making a great race for the ores of this camp.

The California, which was recently placed and incorporated at Toronto, has been started up under the direct personal supervision of F. C. Loring. The property has an excellent surface showing upon four different and distinct veins. For the present work is only being executed on what is known as the North vein, which is being stripped and cross-cut, it being Mr. Loring's intention to find the most suitable place to commence underground operations. A diamond drill is on the property and has been boring continuously for the past ten days.

The Mugwump, adjoining the War Eagle and Iron Mask, is looking well, a strike of the usual Red Mountain product being made a few days ago in a shaft almost at the very grass-roots. This showing is improving materially as depth is attained. The company owning this property have also had a diamond drill installed at the lower end of the property near the line of the Columbia and Western Railway. The machine is being run on but one shift, and cores have been taken out for a distance of 140 ft., but the ledge, it is not expected, will be encountered before the end of the present week.

The Hill Top, which adjoins the May Flower in the south belt, and which has just been successfully placed on the eastern market, commenced operations this morning. The owners claim for this property the same lead that is found on the May Flower, and also that they have uncovered already a body of pay ore.

The strike recently made in a shaft on the White Bear at a depth of 45 ft. is improving and everything goes to show that the ore chute encountered is following the usual rule of Trail Creek mines and is improving as depth is attained. The average of the ore is \$23 in all values per ton. Oudin & Cole, the owners, are greatly elated over this strike, as it was the first evidence of a pay chute on the claim.

The Provincial Government has just helped Rossland for the first time by donation from the Provincial treasury. The \$800 put in the hands of the Ratepayers' Association is being utilized in an endeavor to establish a uniform grade on Columbia avenue. Already the streets present a much improved appearance.

Meeting of the Asbestos Club.—The regular meeting of this Club was held at Black Lake on 30th ulto. Capt. Matthew Penhale, who has been associated with the industry and the Club, since its inception, is about to leave the district, and Mr. R. T. Hopper on behalf of the members took occasion to express regret at his departure, paying a high tribute to Mr. Penhale's zeal and energy in promoting the affairs of the Club. Thereafter a pleasant time was spent in those social functions for which the Club enjoys a high reputation.

Hall Chrome Mine.—One of the most productive of the Eastern Townships Chrome mines, that owned by Mr. G. B. Hall of Quebec, has been leased on royalty by Mr. J. M. Johnston. Several hundred tons of ore estimated to exceed 50% have been exposed and will be shipped at an early date.

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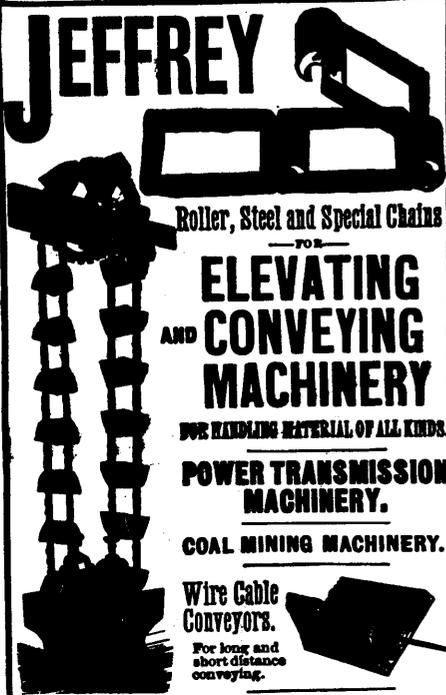
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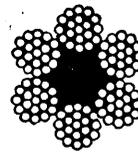
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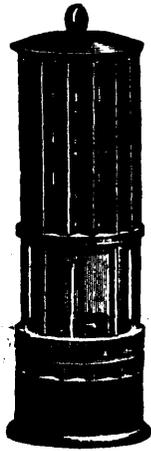
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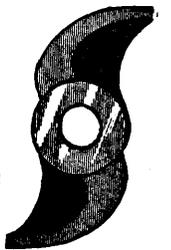
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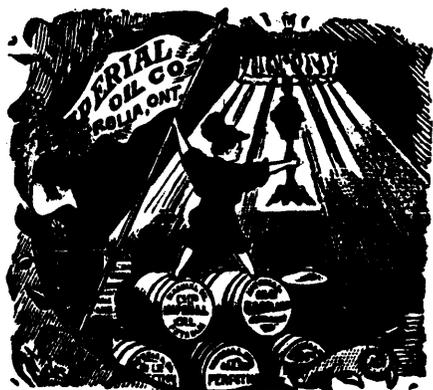
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For further information see the calendar of Queen's University for 1894-95, p. 117.

4. *Prospector's Course.*

The School offers to Mine Foremen, Assayers, Prospectors and Mining Men generally, Special Courses of Instruction beginning January 8th, 1896, and continuing eight weeks.

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Lecturers will be sent to Mining Centres to conduct Classes in Elementary Chemistry, Mineralogy and Geology as applied to the discovery and winning of valuable minerals.

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The BRUCE CARRUTHERS SCHOLARSHIP (value \$200 per annum) will be awarded in May. Its object is to aid one who has had some experience in amalgamating, etc., in acquiring a good education in Mining Engineering. The conditions of the award will be made known on application to the Director or the Bursar.

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Under the provisions of chap. 1, Acts of 1802, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay

Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted gold valued at \$18 an ounce.

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

MINES OTHER THAN GOLD AND SILVER.

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

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

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

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

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

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

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

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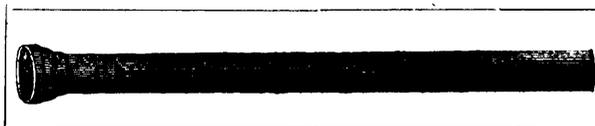
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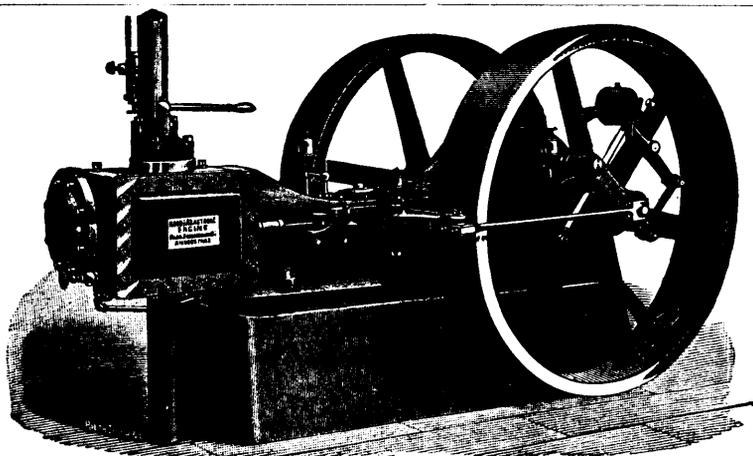
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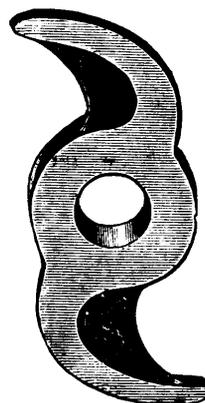
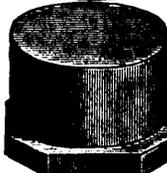
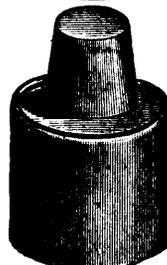
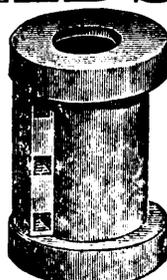
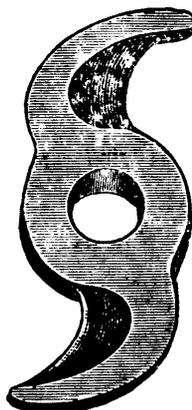
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