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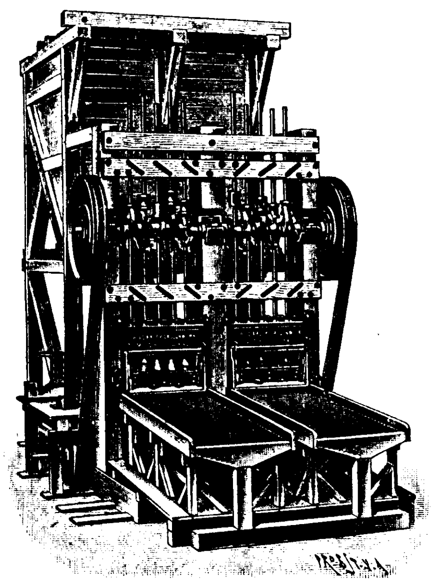
FRIED. KRUPP GRUSONWERK



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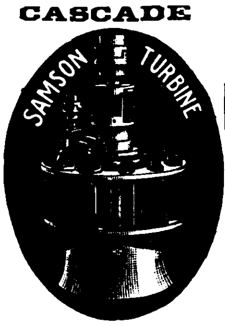

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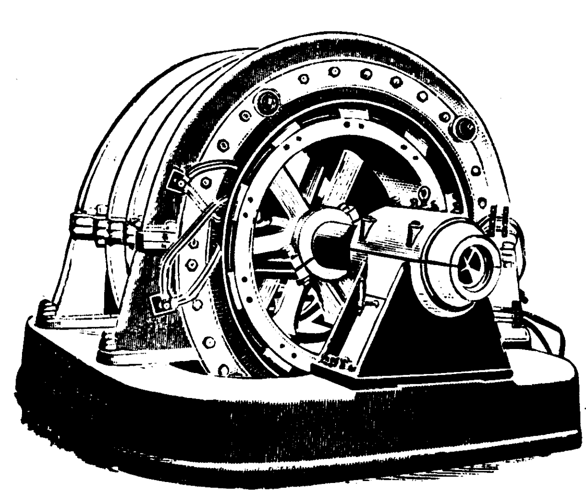

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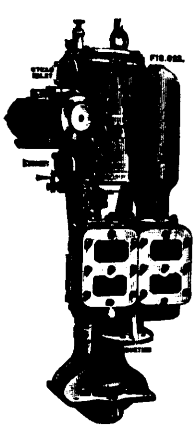

Fig. 620—"Griff" Sinking Pump.

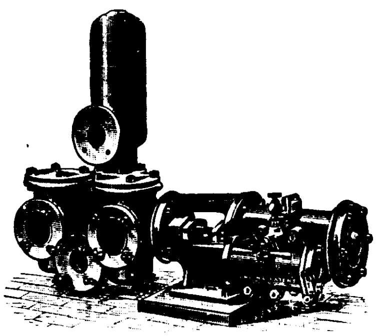

Fig. 598—"Cornish" Steam Pump for Boiler Feeding, etc.

OVER 12,000 PUMPS IN STOCK AND PROGRESS

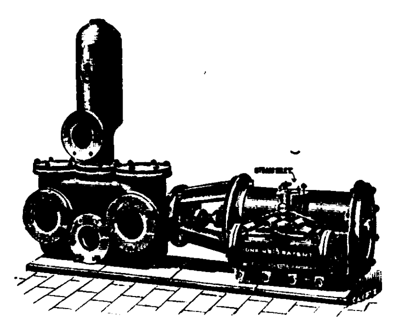

Fig. 600—"Cornish" Steam Pump for General Purposes.

Fig. 621—"Cornish" Sinking Pump (Ram Type).

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17th YEAR OF PUBLICATION.

The CANADIAN MINING REVIEW

Established 1882

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

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VOL. XVIII., No. 4. | APRIL, 1899. | VOL. XVIII., No. 4.

Profligate Joint Stock Company Legislation.

Waste of material in industrial processes and of energy in all lines of activity, works the destruction of capital aud power. It is due to waste of energy that syndicates and trusts are able to appropriate, without Act of Parliament or Right of Domain, the business of trade rivals who have expended the strength of their sinews of war in vain competition. And it is due to the supreme folly of investors in mines, to popular ignorance of simple business principles, to the neglect of reforms which do not originate within the sphere of party politics, that the waste of mining capital far exceeds the sum of safe mining investments. It is true that waste belongs to decadent civilizations, as the production of rags in lazarettos, the old metal and usury business of the Ghettos, and the lotteries of Spain and Italy. But that the Province of Ontario should seek to open the treasures of her mineral resources with the aid of a Joint Stock Company law, adapted to promote the devices of curb-stone brokers, the deception of the public, and the discredit of mining enterprise, gives its legislation a provincial note and character ill fitted to support the claim of this to be the premier member in the Canadian Confederation.

New Jersey, of all the United States, seems to afford the greatest facility for the manufacture of corporations. It derives a large revenue from fees for charters. The sum of $126,000 from the charter-mill was paid into its treasury in March. As between the Provinces of the Dominion free trade in charters like that of New Jersey might be wise policy. It might be well for a Province to hold out that for moderate fees it would offer the greatest range of powers and the most unlimited scope for the issue of capital, and would provide the simplest machinery for the g.eat business of exploiting the pockets of the community with the least risk of litigation against ingenious enterprise. The charter-brand of such Province would have a known value for the attainment of any purpose not necessarily honest. A few postulates would express the spirit of the legislative sanc tions surrounding the gift of its corporate franchise for mining purposes: (1) Let it be granted that a mining company's capital shall contain, together with six ciphers, as many more as possible. (2) That the greatest common measure of the number of shares shall be the minimum fractional currency. (3) That as many indifferent titles as possible shall be appendices to the full names of Directors.

The legislation which sanctions free trade in charters is based on the assumption that investors in mining shares are either fools or knaves who have no right to the special protection provided for all shareholders by the Stock Corporation Laws of many other countries, such as Belgium, France and some of the United States. Such assumption discredits the mineral resources of the country, by a necessary mental process giving origin to the belief that, if our mineral wealth is a certainty, it requires no appeal to dealers in risks and chances to procure necessary working capital. A recent number of the *London (Eng.) Financial Times* quotes with show of surprise at his audacity, the statement of a Canadian company promotor: "What I want is to sell and get the cash in my pocket, and when I've got it the British public can go to Dawson." With the Ontario Mines Act in hand such impudence calls for no remark, except that the promoter might have got an Ontario charter at much less cost than an English one, and that his benevolence should have consigned the British public to a warmer climate than that of Dawson City. The *Times* remarks also that "some English promoters of a very undesirable class have been sedulously endeavoring to exploit Canada." The field has been fairly opened by the Ontario Legislature to all comers; and it would not be strange if the Anglo-American *entente* and the beaker of Imperialist patronage shall overflow their margin upon the Lady of the Snows. Then the boomsters of London, New York, Toronto and Montreal will unfold their wings in the beams of our easy-gotten franchises, and sail out on the summer air to exercise suctorial privileges upon widows and clergymen, seamstresses and artizans, school-teachers and young legates carrying hard won money to burn, and all that ilk After a short season will come in its turn the usual pathos about the advantage of bringing in British and States capital for development, and of pity for its loss, and the customary platitudes about lack of managerial skill and the risks of mining operations will do duty in the dailies as funeral services over the graves of the blasted hopes of swindled shareholders.

It is quite easy to avoid all this tragedy with its curses. It is quite within available intelligence to frame and administer stock corporation law that will make investment in mining shares even less hazardous than bank stocks. Such a result will involve conditions that will wipe out worthless mines, bogus schemes, fradulent promoters, and mining fakes and fakirs everywhere. It will diminish the charter-mill's earnings but it will increase the investment in solid mining concerns and send up on the share list every sound proposition now asleep for lack of working capital. It will give work and wages to mind and muscle wherever a mine exists within the physical conditions necessary for yielding dividends. No one denies all this unless prepared to maintain that honesty in mining enterprises will drive away capital. A correspondent gives another reason for a let-alone policy thus: "I have so little confidence in the honesty of the general public that I believe they would gamble on something more injurious if they did not have the mining form to amuse them," leaving it to be implied that gambling "in the mining form" may as well be maintained on the level of his view of public honesty.

The Joint Stock Company is peculiarly a creature of the State. It is eminently fitted to promote the co-operation of capital and industrial undertakings. It is a prostitution of the functions of the State to grant the franchise of corporate powers for the sale and transfer of land through the medium of stock certificates, and for a merely speculative purpose under the guise of mining enterprise. The persons granted incorporation for working mines should be corporators united in virtue of their respective contributions to a common fund, and should not be granted incorporation without a substantial portion of paid-up corporate stock The capitalization of the property should not be permitted without inspection on the part of the State. To do otherwise opens the door to gross frauds. The *Financial Times* mentions that "alleged mines not known to be such were put on the British market with engineers' certificates and such like testimonials in abundance." The advice is given by that journal that English investors should make a personal examination whenever possible, or at least in every case send a thoroughly trustworthy agent to go over the ground. "This is regarded as impossible with the great army of small investors whom the dishonest company promoter and the tout of worthless shares prey upon. These are advised not to be caught by big promises nor by Canadian names and designations, however high sounding, which they know nothing about, and not to buy anything which has not received the approval of some recognized authority in England."

Such wise words are an indictment of our Joint Stock Mining Companies' law. "In France when anything besides cash is offered in payment of stock its value must be determined by a special meeting of all the stockholders. The persons interested cannot vote. At such meetings a committee must be appointed to determine the value and report to the stockholders at another special meeting where the value is fixed by a vote. The resolutions at all these meetings must be signed by all the stockholders. In Massachusetts a statement that the valuation of the property offered is fair and reasonable must be made, signed and sworn to by the president, treasurer, and a majority of the directors, and endorsed by the State Commissioner of Corporations and filed with the Secretary of State." Were the safeguards of the French and Massachusetts law incorporated in our Ontario statute, along with the provision that a substantial part of the stock should be paid in cash before incorporation, capital would gravitate towards Canadian mining investment as in no other country in the world. Industrial enterprises would gain consideration in consequence, and the hum of prosperity in the arts dependent upon mining activity would be greater han any mere tariff or other legislated policy could promote. And all this would come from the plain principle of right that the investor in mining shares who is scarcely ever able to visit the property in which he puts his money should have every fairly conceivable protection against deceit and swindling, instead of as now being recognized *in law* as the legitimate prey of every mining company promoter who can adroitly shape his ends so as to get the investor's money without becoming liable to prosecution or damages.

NEWFOUNDLAND COPPER.—The manager reports under date March 7:—"Sleepy Hollow—No. 2 shaft is about 2 ft. wide and yielding 4½ tons of ore per fathom." In a cable dated April 3 he reports: "Sleepy Hollow—No. 2 has improved."

A Annual Bon Bouche.

The Report of the Department of Mines, Nova Scotia, is a *bon bouche* annually looked forward to, and the attractions it usually furnishes are not wanting in the present issue. This "work" maintains its high standard of composition, and as in the past suffers for examples to high school students, even be it noted in a Province that prides itself on its school law and concurrent high expenditure per head. Without desiring to pick out all the plums embedded in this blue "matrix," we cannot refrain from selecting as examples the following, premising only that the italics are ours: "The *coal* to the rise is being worked 'longwall,' and can be *done* very cheaply. They have a *nice* hoisting engine and boiler and a good pump. The water in this vein does not accumulate very rapidly, owing to the fact that *they* have a good *vein* of blue clay overlying *their* coal measures which prevents the surface water from getting in. *This mine* also complied with the law." Take another case: "He fell and the trips passed over him, causing death, *notwithstanding that riding on the trip was strictly forbidden in that colliery.*" Literary gems of this sort one does not expect to find in an every day report and the government is to be congratulated on having officers ready to produce them year after year, and despite repeated laudation continue to expose shortcomings. Additional literary talent was engaged in the collaboration of this issue, and the mystic number seven was invoked to mutual admiration. We half feared that with the increase of staff a compromising medium might be reached and the fire of originality quenched, but no, all classes of our readers will find excellencies to give each in his own line special pleasure; the statistician, the prospector, the gold miner, the legislator and the historian, each in his turn. The statistician will rejoice to find that the figures 58,090 and 6,023 total to 6,413; again, that 1,116 persons put in an average of 382 days apiece during the fiscal year, while the pits at which they worked were only operated 164 days during the same period. It would appear from these figures that the fiscal year treated of is longer than the customary calendar year, and we almost conclude such must be the case when we re-open the previous report and find that 210 persons are recorded as having worked during that year no less than 2,215 days apiece. Among other originalities is the entry that the last three months of 1897 are called the first quarter of 1898.

The prospector will find on the seventh branch of the golden candlestick praise of past prospecting in Cape Breton, and that "owing in part . . . to the mistakes of a few investors . . . the island has not received in the past the attention," etc.; "that nothing good of a metallic nature can come out of the island . . . is a false impression. . . . There is no doubt but that . . . the older rocks . . . are capable of successful development if," etc. "The erratic and unscientific method of much of the search must be held responsible for a fair share of the failure to see any good in the country. In many walks of life the man who knows the shortcomings of others is generally apt to turn his knowledge to account and make an honest livelihood or a fortune out of his knowledge and their ignorance; not so the prospectors' critics, who are a perennial crop generously satisfied to find fault and also to refrain *from applying their* wisdom to their own advantage.

The gold miner whose powers of observation have become blunted through familiarity with mining problems will be pleased to find called in the supervision of a virgin mind employed at technical schools and unharrowed by experience, and yet as the law reads "inspection shall be by a practical mining engineer," may it not become dangerous for the occupant of the office to show the legislator that the work can be done by a cheap substitute?

The legislator will be gratified to learn of the high regard paid to this report by those interested in mining, both at home and abroad. The evident care in its preparation, the thorough reliability of its statistics and its general get-up make it invaluable as a work of reference. It is not as though it were put together anyhow by one who, complaining of want of time, yet rehashed "works" in mere popular periodicals, or by a nature that took unkindly to accuracy, like Borrow, he of the Bible in Spain, who airily wrote of "some weeks" when he meant a few days. Compared with a report of ten or twenty years ago, we find many tables and separate columns of old acquaintance eliminated from this report. This is evidently wise. It saves trouble to the compiler, shows they are otherwise overworked and avoids errors in preparation.

A correspondent writes that he had occasion to look over the table on page 73, a manifold slip caught his eye, and his curiosity being aroused he compared it throughout. To his satisfaction, he says, he discovered that the page was embellished with no less than eleven variations.

Possibly the most glaring exposé of the infirmities of this remarkable official document is made in the subjoined inventory of its inaccuracies prepared by Mr. W. L. Libbey of the Brookfield Mining Co., for the delectation of those who had the pleasure of attending the annual meeting of the Mining Society of Nova Scotia on 12th instant. Mr Libbey says:—

"As the Annual Report of the Department of Mines is the official record of the annual progress of the mining industry, in its various branches, which is available and probably always referred to by prospective investors and statisticians when this Province is under consideration, it cannot be thought to be otherwise than desirable that such a report should be fairly correct in such details as are treated officially.

On several occasions the attention of the writer has been called to discrepancies between his and the statements in the Mines Report, therefore he has ventured to audit the Mines Report partially for the two years ending September 30th, 1897, and September 30th, 1898.

The result of the work which has been only in the Department relating to Gold is now laid before you, with the hope that this paper will be thoroughly discussed by our Society, and in this connection it might not be amiss to call attention to a remark on page 46, in the report ending September 30, 1898, concerning the Leipsigate District, which reads as follows, and which would lead one not acquainted with the locality to suppose that there might be a silver mining industry in that region.

The remark is: "A feature of this district is the production of silver which though small is unique."

As probably nearly if not quite all of the gold product of Nova Scotia finds its way to the United States Assay Office in Wall St., New York, where it is "parted" and the relative proportions of gold and silver reported to the one sending bullion, it certainly seems to me "unique" that we should find serious mention of silver production in this particular location.

In submitting these corrections in the Mines Report for the discussion of this Society, the writer wishes to be understood as not having grievance against any individual member of the Mines Office staff, for the most unvarying courtesy has always been met with.

YMIR (British Columbia.)—Cablegram from Nelson (British Columbia): "The yield from last month's working is—total amount crushed, 250 tons dry weight; gold amalgam, $1,200; gross estimated value of concentrates, $900."

Our Imports of Mining Machinery.

Notwithstanding the very large and rapidly expanding business done annually by our Canadian manufacturers of mining machinery, an industry which has assumed substantial proportions with the growth of mining throughout the Dominion, it is worthy of remark that our imports from other countries show a corresponding increase. During the year ended 30th June last we find that machinery to the value of $207,737 was admitted duty free as against a value of $128,780 imported in 1897. The United States supplied $177,046, Great Britain $22,063, and Germany $3,306. Ontario took $96,159, British Columbia $47,530, Quebec $30,038, Nova Scotia $15,371, New Brunswick $10,946, N.W. Territories $2,372 and Manitoba $30. In addition to the above there was imported dutiable mining machinery to the value of $38,589, of which $31,664 went to Ontario and $6,682 to British Columbia. These figures, however, convey but an approximate idea of the importance of our mining industry to the trade of the country, for we find in the *Trade and Navigation Returns* many entries of machinery and supplies consumed by our mining industry which are not classified in the tariff items relating to mining. Here are a few culled at random from the report: Pumping engines and machinery $93,594, crucibles $12,533, Diamond drills $5,291, chrome steel (shoes and dies, etc.) $16,044, copper plates $231,938, quicksilver $36,425, cyanide $4,481, wire rope $58,524, wire cloth $10,672, explosives $12,127.

The fact that the bulk of this trade has so far been secured by the United States should stimulate the British manufacturer to greater zeal and enterprise in making a bid for a larger share of our mining business.

Mica Mining in India.

It is only within recent years that Europeans have taken up the mica industry. Mining is still conducted on purely native methods, for in none of the mica districts is machinery of any kind used. Mr. A. Mervyn Smith says, in a paper read before the Institution of Mining and Metallurgy, that the same wasteful, slow and laborious system practiced by the natives for hundreds of years is still in vogue. Tufts of mica are discovered usually after exceptionally heavy rains, and these are marked off for mining as soon as the dry season begins. Books of mica are first split into plates about ⅛ in. thick, the mica being easily split into laminæ of any thickness. The trimmers are provided with sharp sickles, and the point of the knife is used for opening the sheets. Imperfect laminæ are now peeled off the plates till both surfaces show a clean, even face. After trimming, the plates are sorted for the European market, the United Kingdom and America being the chief buyers The best quality is ruby mica, which is much used for the doors of glass and steel furnaces where extreme heat is required. Mica is not affected by the heat, and thus enables the workmen to look into the furnace and watch the crucibles of molten matter. Thin sheets are made into chimneys for incandescent gas burners; also for ore screens and for electrical purposes, as mica is an extremely bad conductor of electricity. A method of cementing sheets of mica into cardboard has been recently patented in Germany, and this cardboard is used for coating boilers, mica being a non-conductor of heat. It is also manufactured into helmets for fire brigade men, packing for greproof rooms, etc. Thinner sheets are made into envelopes for wrapping valuable documents.

BOSTON & NOVA SCOTIA COAL CO. LIMITED.—The coal lands of this company in Inverness Co., Cape Breton, have been acquired by D. D. Mann, of Montreal, and associates and will be worked extensively.

A Tabulated Statement of a Few Inaccuracies in the Mines Report, N.S., 1898.

Districts Page 34.	Days Labor.	Miles.	Tons Crushed.	Average Yield of Gold. Oz.	Dr.	Gr.	Total Yield of Gold. Oz.	Dr.	Gr.
Brookfield			1112						
Should be			11112						
Lake Catcha	3908								
Should be	3818								
Millipsigate							1631		
Should be							1630		
Montague					4	8	199	8	10
Should be					12	13	1250	10	9
Other Districts	3810				12	13	1254	10	23
Should be	3310				4	8	199	8	10
Totals	186812		86331						
Should be by figures given on this page	187312		76331						
Should be with corrections in items	186722		86331						
Montague Page 70				1	13	1			
Should be				1	12	2			
Salmon River Page 70					7	4			
Should be					8	5			
Wine Harbor Page 70					13	11			
Should be					0	17			
Wayerly, Page 70, Total value of gold $1,165,669									
Should be $1,162,682									
Wine Harbor, Page 70, value of gold $555,821									
Should be $441,821									
Totals Page 70			1063008				666452	11	19
Should be			1063004				660452	11	14
Value of gold, Page 70, $126,625,887									
Correct addition of their figures, $12,662,587									
Corrected addition, with corrected items, $12,548,600									
Totals Page 74	5715239		1116254				685551	5	14
Should be	5715269		1106254				685540	11	20
Gold River Page 76	185								
Should be	155								
Millipsigate Page 77							1639		
Should be							1630		
Lake Catcha Page 77	3908								
Should be	3818								
Uniacke Page 79							1779		
Should be							1789		
15 Mile Stream Page 80			3495				937		
Should be			3375				597		
Montague Page 83							1254	10	23
Should be							1250	10	9
Caribou Page 83	14416						1201		
Should be	14446						1202		
Stormont Page 80	50374								
Should be	49374								

Districts Page 34.	Days Labor.	Miles.	Tons Crushed.	Average Yield of Gold. Oz.	Dr.	Gr.	Total Yield of Gold. Oz.	Dr.	Gr.
Wine Harbor	1293								
Should be	1283								
15 Mile Stream			9158		6	5	2856		
"			9128		6	6	2866		
Stormont	43486				13			18	
"	43386				7			15	
Brookfield			8076		5	7	3366		
"			8100		8	13	3472		
Caribou & Moose River			9324						
"			9314						
Uniacke, South & Mt.	4985							4	
"	13795							9	
Sherbrooke	561110					13	4181	18	
"	56110					14	4182	2	
Waverly					13	7			
"					11	10			
Cow Bay					15	15	560		
"					15	14	559		
Tangier					16	2	299		
"					13	10	249		
Killag						8	393	19	
"						10	394	7	
Montague				1		6			
"					4	14			
Oldham Page 34					18	17			
Should be					18	7			
Leipsigate Page 34					7	8			
Should be					9	20			
Unproclaimed & others, Page 34	4554				13	15			
Should be	4964				13	11			
Totals Page 34	207255	37	76559				26595	6	21
Should be according to their figures	*712255*	*35*	*76489*				*26615*	*9*	*21*
Should be with corrected items	216365		76473				26691	2	21
Totals Page 69	5529057		1029923				654446	8	14
Should be	5529087		1019923				654445	14	20
Cow Bay Page 70							560		
Should be							559		
Sherbrooke Page 70							4181	18	
Should be							4182	2	
Caribou Page 71			9324						
Should be			9314						
Uniacke, So. & Mt. Page 71	4985								
Should be	13795								
Stormont Page 72	43486							18	
Should be	43386							15	
Killag Page 73							393	19	
Should be							394	7	
Wine Harbor Page 74	1293								
Should be	1283								
Tangier Page 74							299		
Should be							249		
Brookfield Page 75			8076				3366		
Should be			8100				3472		
15 Mile Stream Page 75			9158				2856		
Should be			9128				2886		
Montague Page 77								1	
Should be								0	
Unproclaimed Page 78	4554								
Should be	4964								

Inspection of B. C. Mines.

The following is a summary of the provisions of the Act passed during the recent session of the Legislature of British Columbia amending the Inspection of Metalliferous Mines Act. Among other things it provides that it shall be the duty of the inspector, in case a mine is in a dangerous state, to post up in a conspicuous place at the mouth a notice warning the workmen. Further, owne's must give notice of any serious accident, and no person may be employed underground for more than eight hours in the twenty-four. Explosives must not be thawed underground in any mine. Following are other important sections:—

Any adjoining owner may apply to the inspector for the purpose of learning whether such mine is being worked into his territory, and upon such application being made the inspector shall examine the plans of such mine, and if necessary examine the workings of such mine, and make report thereon to such adjoining owner as to whether his territory is or is not being encroached on.

Not less than 75 cubic ft. of air per minute shall be made to pass through every mine for each man and beast employed therein.

All permanent buildings for housing boilers, engines and machinery shall be erected at a distance of not less than 50 ft. from the mouth of any mine.

Slides, or conductors, for shafts which are at least 100 feet deep shall either be iron shod or all iron.

All vertical shafts of a depth of at least 50 ft. shall be provided with a crosshead and guide, and such crosshead shall descend as such shaft is sunk, so that at no time shall it be at a greater distance from the bottom of the shaft than 30 ft.

No stope or drift shall be carried on in any shaft which shall have attained a depth of 200 ft. unless suitable provision shall have been made for the protection of workmen engaged therein, by the construction of a bulkhead of sufficient strength or by leaving at least 15 ft. of solid ground between said stope or drift and the workmen engaged in the bottom of such shaft.

A chain ladder 20 ft. in length shall extend from the bottom of the wooden ladder to the bottom of the shaft.

An Improved Ore Skip.

By A. A. HAYWARD, Waverley, N.S.

(Read before the April Meeting of the Mining Society of Nova Scotia.)

Among some of the crude mechanical contrivances used in the equipment of metaliferous mining plant, none is so much in evidence as the old fashioned skip with its wide flanged wheels behind and narrow ones in front, and which, in order to dispose of its load or contents, must turn upside down, and in so doing cause a large amount of wear and tear on any receptacle used in receiving the ore or waste rock, while its mechanical movements are anything but inspiring. The writer, having had an average amount of experience with this mechanical monstrosity and never having been satisfied with it as a means of handling ore, to say nothing of its ungraceful acrobatic performance, decided that in the equipment of the Golden Group mine at Montague to see if something could not be devised that would more successfully and satisfactorily fill the requirements, and, after investigating the various appliances used in hoisting ore from the mine, none were found that filled the bill, so it was decided to build one on entirely new and different lines.

The most natural way to unload a skip seems to be from the bottom instead of from the top, which necessitates the turning upside down of both load and skip. As the construction and operation of this skip is somewhat of a new departure, a detailed description of its construction and operation may be of interest.

The box or skip body is constructed of 3-16 in. steel built on 3 x 3 in. angle iron, riveted with ½ in. rivets, the size being 30 x 36 x 60 in., having capacity for about 37 cubic feet. On the inside at both top and bottom there is a band of ½ x 4 in. iron, which is securely riveted to the sides of the skip and the angle iron in the corners. This serves to keep the body of the skip square, and at the same time takes up the wear occasioned by receiving and discharging the load. On the bottom there are two steel doors, 15 x 36 x ½ in. These doors are re-enforced by strips of steel ⅞ x 6 in., and are securely fastened to the bottom of the skip on each side by 3 hinges on each door. As the doors have to withstand the entire shock occasioned by the dumping in of the rock, both doors and hinges are made exceedingly strong, the hinges being made of 1 x 5 in Swedish iron and run entirely across the doors, to which they are fastened with ⅞ in. rivets. Across these doors running lengthwise are two axles, each 2 x 2 in. and extending 2 in. on each end over the ends of the door. These ends are turned down to 1½ in. so as to receive the ends of the connecting rods. These rods, four in number, two on each door, or one at each end, are made of 2½ x ½ in. iron and are about 2 ft. long. These rods on the other end are connected with the side rods of bail which passes up on two sides of the skip and is held loosely in place by two clips on each side. These clips are made of ½ x 4" iron and are bolted to the body of the skip by ten ½ in. bolts, bolts being used so that these clips may be removed at any time it is desired to remove the bail. This bail or side rod is made of ½ x 5 in. iron and extends above the skip about 2 ft. These two strips or bail are connected across the top by ⅝ x 6 in. piece which is mortised into the side rods. The top end of these side rods are connected to a ring in the centre, to which a cable or hoisting rope is attached. On the sides there are two sets of guide shoes. These are made of 3 x 3 in. angle iron, which are faced with 3-16 x 6 in plate. Inside of these guide shoes and fastened to the side of skip are pieces of hardwood 2 in. thick. 2 ft. long and 6½ in. wide. These are used as a rubbing board to take up the wear of the guides, the guides themselves being 4 x 6 in. spruce.

As I have explained, these connecting rods are attached to the the axles on the door, the other ends being connected to the side rods which have a plate in the clips, the side rods themselves being connected to the cable. It will be seen that the load and skip are raised by a direct pull on the doors and that when the skip remains suspended it is impossible for the doors to open. A skip when at the various levels in the mine ready for filling is always suspended by the cable so that the load is dumped in and on to these doors. When the skip is hoisted to the surface sufficiently high to admit of a car being run underneath, a set of clutches engage the sides of the skip, holding it securely; an electric signal is then given to the engineer, who slacks back on the cable, when the weight of the load forces down the doors, at the same time pulling down the side rods. As the width of these doors is only 15 inches, it will at once be seen that the rock in the bottom has only to fall 15 inches and whatever depth the car may be, while the remainder of the rock cushions on that already in the car, thereby very materially reducing the shock.

As the entire arrangement is nearly automatic, it is all done in a few seconds. When the material has been fully discharged the engineer hoists, the side rods now move up, the connecting rods close the door and the skip is now ready to descend for another load.

This skip was in operation about two months and during that time hoisted about 3,000 tons of ore and waste material and gave every satisfaction.

The Rare Metal, Tungsten.

A. C. ROSS, Sydney, C.B.

(Paper read before the April Meeting of The Mining Society of Nova Scotia.)

There is very little literature on the occurrence of this metal. It found in an ore known as wolfram or wolframite and usually associated with tin, as, for instance, the tin mines of Cornwall.

A deposit of it was discovered last fall at North-east Margaree, C.B., in a ravine between and near the base of two mountains that attain an elevation of about 800 ft. The metal is in a fissure vein having red granite walls. The lead where first discovered in place was about 2 ft. thick, dipping at an angle of seventy degrees. It has been traced across the ravine for over 200 ft. into the mountains. Some development work has been done by driving tunnels into the mountains on the lead. This development shows that the lead takes the form of barrel shapes and lenses and in some places splits into two veins, one on each wall. The first block of quartz taken out of the lead at the point of discovery measured 2 x 3½ ft. and contained upwards of one-half ton of ore, which gave 50 per cent. of metal, samples of which assayed 68 per cent. of tungstic acid. Since then very little metal has been found in the ore.

The winter not being a suitable time for prospecting work has been suspended until spring, when further development will be made in this and other parts of the district.

The uses of this metal are numerous. It is especially valuable as an alloy for steel and is useful in the manufacture of tool steel, armor plate, guns and projectiles on account of its hardening, toughening and self-tempering qualities. It has been found to be almost impossible to get a uniform temper in the manufacture of large guns with the ordinary alloy used with steel. In the recent war between the United States and Spain, the large guns were found to be practically useless after being fired from sixty to one hundred times. The chambers, not being of uniform hardness, became scored. A small percentage of tungsten as an alloy will give the uniform hardness and temper required to any mass of steel. Nine per cent. of tungsten alloyed with steel will give a self-tempered tool steel for lathe and other work which will stand great wear. It is also used in making dies and stamps. What is known today in commerce as "Mushet" steel, which is manufactured in Sheffield, contains 9 per cent. of tungsten. This steel sells to-day (small quantities being imported as ordered for special lathe work) for seven times as much as the highest priced ordinary tool steel. It is a self-tempering steel and is conceded to be the best steel made for lathe, planing, boring and slotting tools, milling and nail-cutters, counter-sink and twist drills, taps and dies and hot punches. It does not twist in hardening, is easy to forge, file or tool, and machines may and should be driven at a speed far in excess of any that can be used with any other steel.

Tungsten steel has a great capacity for retaining magnetism. A German specimen showing a remanent magnetic moment of 62 units as against 37 units for "Diamond steel," 5 units for "Martin steel," and only 3 units for "Bessemer steel."

Samples of the ore have been tested in Germany and London, as well as in this city, and in every case have been pronounced of good quality.

The production of the metal today in the world does not exceed 1,000 tons. The demand greatly exceeds the supply even with the existing high prices. If it proves to be in this country in sufficient quantity to enable its being put on the market at say half its present value its consumption would increase a thousand fold.

All miners will appreciate the great advantage it would be to have rock drills that would not soften in work no matter at what speed they might be driven, but remain tempered and ready for work on being ground or hammered to the required shape. A tool of tungsten steel can be pointed on an emery wheel, or with a hammer after being heated to a cherry red, and used on the hardest cast steel without being tempered by emersion in oil or water.

The ore concentrates well on account of its high specific gravity.

If the metal is found in sufficient quantity to warrant it a concentrating plant will be erected on the ground capable of treating twenty tons per day.

An Incident in Systematic Prospecting Connected with the Discovery of the "Rose" Lead, Montague, N.S.

By Geo. W. Stuart, Truro, N.S.

(Read before the April Meeting, Mining Society of Nova Scotia.)

The two most incumbent duties one very mining man who has at heart the present and future welfare of the greatest industry on earth, is:

First: To freely impart all information of value of a practical, technical or theoretical nature, not only for the benefit of his co-laborers, but for the general interest and benefit of the mining industry, and the country at large as a whole.

Second: To have the moral courage to discourage by unqualified denunciation the promotion of everything, and every case, savoring of the "wildcat" character.

The incident which I am about to refer to may not be of great interest to the many learned professional gentlemen present, coming as it does from a practical prospector, and therefore touching only on the genesis of mining. But let me remind those more highly honored gentlemen, they never can discharge their indebtedness to the prospectors in the field, the men of bone, sinew and muscle, and indomitable pluck, willing to suffer fatigue, hunger, and all manner of privations in their indefatigable search to unbosom the treasnres of Mother Earth: such men are the fathers of the mining industry.

For several years previous to 1878, in the District of Montague, rich quartz drift, of a rose colored hue, were found scattered over the south-eastern part of that section. The chief part of the drift was found on the northern side of the hill which skirts the southern side of the district, and rises from 25 to 50 ft. or more, above the level of the principal part of the district, and some 2,000 ft. from where the "Rose" lead was eventually discovered These boulders were found at all depths in the surface, from the top to 15 ft. down on the bed-rock; the greater number, however, were found near the grass roots. While, as I have said, the greater portion of this rich quartz was found on the hill side, yet many pieces were found along the line of glacial movement, for a mile or more, but none, to my knowledge, within 500 ft. of the lead which was their source. Thousands of dollars were spent searching for the lead in the vicinity of where the greatest quantity of drift was found, and I had spent much time myself in that quarter, only to meet with disappointment.

In the vicinity of 1,500 ft. south of where the lead was found, I had frequently noticed a large whin (quartzite) boulder, of perhaps 20 tons weight, with a narrow corrugated, or serpentine, seam of slate running through it; and one day during my peregrinations on the northern side of the district, I came upon the spot where this particular whin boulder had been *in situ*. I recognized this fact, not only by the corrugated slate seam in the rock, still *in situ*, but also by the shape of its vacant seat in the side of the bluff. This discovery caused me to change somewhat my ideas of prospecting, more especially because of the fact that this large boulder had sharp angle corners, giving little evidence of erosive wear and tear, at least on the sides exposed, although it had travelled not less than 2,500 ft., in a direction, I determined by the glacial striæ, from the north, 2 degrees east of south. I had no difficulty in determining this to be the true glacial course in this section, by the well defined striations on the bed-rock, where it was not shattered, or too long exposed to atmospherical action. Later, several hundred feet north of where the large whin boulder was located, we found a large quartz boulder, weighing, perhaps, 500 lbs. In one end of this large boulder there was imbedded a wedge-shaped piece of soft whin (quartzite) 14 in. long and 4 in. thick at the butt. It was a matter of much speculation with us at the time, as to whether this boulder came off the long looked for "Rose" lead, consequently it was thoroughly examined before being broken up for the gold it contained; this boulder showed little or no wear from movement.

A year later on the 7th day of December, 1878, I found the lead —the "Rose" lead. My partner, the last of six of us at the beginning, abandoned the pit, and the search, only the evening previous. It was not much wonder, we were down to "hard pan"—"on our uppers." Even the much prized ring, made from my first collection of gold, had found its way to the crucible, and had been exchanged for coin to supply the "crust" to meet nature's demands.

Forty feet east on the lead, from where I first tapped it, we found the identical spot where the boulder with the piece of whin in it originally rested; the balance of this little whin "horse" was there *in situ*, and had we preserved the boulder it could have been placed in its original position; the distance it had travelled to reach the place we had found it was 1,200 ft., and when it was found was in the exact line of the glacial striation marks, or in other words, a line run north, 2 degrees west, from where the boulder was found, would strike the lead exactly where it had been *in situ*.

My object in writing this short paper, giving this bit of, I trust, useful and interesting information, is for the double purpose of encouraging those men in the field whose spirits may sometimes flag, and to persuade them also of the great necessity of studying glacial geology, to enable them to more intelligently prosecute their laudable, important and interesting work, in search of the hundreds of rich and valuable gold veins, and deposits, still *in perdu* in this Province, and that can be found by the exercise of intelligence with continued effort and sustained industry.

London & Canada Syndicate.—The secretary reports receipt of a certificate from the Canadian smelting works, Trail, B.C., of an average shipment from the Boundary Creek Mining Company showing 1.67 oz. of gold and 77.10 oz. of silver to the ton of 2,000 lb.

Notes on the Results of Some Laboratory Concentrating Tests of the Ores of Faribault Brook, C.B.

By F. H. MASON, F.C.S., Halifax.

(Read before the April Meeting of The Mining Society of Nova Scotia.)

By the courtesy of the directors of the Cheticamp Gold Mining Company, I am able to give some very interesting results of some laboratory experiments on the concentration of the ores which the company are mining. It is necessary for me to preface my remarks by saying, that the company has come to an understanding with a firm of English white lead manufacturers, who will purchase the whole of the dressed ore at the market value of the lead contents, they stipulate however that the lead contents shall not fall lower than 78 p.c. metallic lead. I merely mention this fact to prevent your asking me at the close of the paper: Why not smelt?

The rock in which the ore occurs is a metamorphic schist, through which run a number of bedded quartz veins. The ore which is galena and blende, is not however, confined to the quartz veins but is found equally profusely in the schist.

For some feet in from the surface the mineral matter in the vein is practically all galena and blende with some small quantities of oxides and sulphides of iron and a little chalcopyrite, so that with a gangue having a specific gravity of about 2-5 no great difficulty was expected in concentrating the ore. In penetrating into the rock, however, it was soon evident that the rusty appearance of some of the surface samples of galena was due to arseno pyrite which had weathered, but which on increased depth was quite solid and closely entermixed with the galena. The schist was also heavily charged in places with a dark coloured arseno pyrite. Under the most favourable conditions mispickel of a specific gravity running up to 6.4 is not easy to separate from a galena of about 7.3, but when the two are closely intermixed with each other it is practically an impossible problem to separate them without very fine crushing which means with galena considerable loss in slimes. However, a trial was made in the concentrator (which consists of the usual size jigs and rotary table) but the best concentrate obtained contained only 33 p c. of lead, while the average was less than 25 p.c. of lead. At this stage it was decided to shut down for the winter, and I was left in possession of a considerable bulk of the poorest concentrates running about 17 p.c. of lead to experiment with. My first experiments consisted of gently roasting small quantities of ore in the muffle and regrinding and panning them. The results were so satisfactory that I decided to make experiments on a large scale, and with the help of Mr. H H. Harrison, the manager of the company, I carried out a number of experiments We first designed and built a small hand rotating furnace which consisted of a shell of sheet iron lined with fire clay and capable of roasting about 25 pounds of ore at the time.

The ore which consisted of arseno pyrite, pyrrhotite, with galena and small quantities of chalcopyrite and blende before roasting came out of the furnace, after being subjected to a dull red heat for an hour with the galena and blende practically unhurt, while the arseno pyrite and pyrrhotite were converted into ferric oxide with loss of sulphur and arsenic, and better the ferric oxide is in a spongy condition holding gases, which give it a specific gravity considerably less than the natural mineral. By gentle rubbing the galena becomes readily detached from the oxide and afterwards separate easily from it, in the jig and on the table. The loss of galena in rehandling by this method amounted in the tests made, to less than one per cent., but there was a considerable loss in silver and gold.

With regard to the gold I was a little surprised to find any in the galena concentrates as I had pre-supposed that it existed in the arseno pyrite, but the silver I expected to find with the galena, instead of which as much as 20 p.c. had been lost. Experiments were next started to see if any silver which might originally have existed as sulphide, had in the low temperature roast being converted into sulphate and gone into solution, but it was found that no soluble salts of silver had been formed during the roast. Further experiments shewed the missing silver to be in the tailings and must have originally existed with the arseno pyrite. I have since found arseno pyrite in the same formation and the same locality without a trace of lead carrying as much as 14 ounces of silver to the ton.

In order to make this process feasible it was, of course, absolutely necessary to find a method for recovering the silver from the tailings and I found that by leaching them with a one half per cent. solution of potassium cyanide and lime water to neutralize any acid sulphates formed in the roast. Not only was over 90 per cent of the silver recovered, but nearly all of the gold also. Thus an arsenical galena ore which originally gave by assay

Lead	19.00 per cent.
Silver	$17.\frac{23}{100}$ oz. per ton of 2,000 lbs.
Gold	$0.\frac{88}{100}$ " "

was by the method described reduced to 27.4 per cent. of its bulk, the concentrator giving by assay

Lead	68.24 per cent.
Silver	$46.\frac{46}{100}$ oz. per ton of 2,000 lbs.
Gold	$0.\frac{28}{100}$ " "

while the bulk of the silver and gold lost in concentration can easily be recovered by cyanide.

In actual practice I am confident that a concentrate giving over 80 per cent. of galena can be made. In a laboratory hand jig work is being done under considerable disadvantage. The stroke is of necessity irregular, and unless it has more than one compartment a sharp separation from the middlings cannot be made.

The plant it is proposed to erect at Cheticamp to further treat the ore by this method will not be a costly one. It will consist of a Hockin Oxland calciner, jigs, and either a Rettinger table or Frue vanners. The advantage of the Rettinger table over the Frue vanner is that it is a matte product table and both galena and blende can be saved.

With a properly arranged plant the cost of roasting and reconcentrating cannot cost more than a dollar a ton of crude concentrates treated, while the cyaniding of the tailings will probably cost from $1 to $1.50 per ton, so that if smelting was afterward done at the mine it is probable that it would be more economical to roast and reconcentrate first.

I believe that it is the first time that fractional oxidation of ores by roasting for the recovery of galena by subsequent dressing has ever been tried, and so far as the laboratory experiments are concerned it will, I think, be admitted that it has been perfectly successful, and I think there is every reason to suppose that it will be equally successful in practice.

The method has been tried and found successful with zinc ores, and it is, of course, common practice with tin ores, but the latter case can hardly be considered to be analogous, as the tin exists as an oxide and a dead roast can be made. In the present case, the most tricky part of the process will be the roasting, which has to be stopped at such a stage as to give the maximum oxidation of the mispickel with the minimum oxidation of the galena. In laboratory practice I found that, bar a slight bloom of oxysulphide of lead on the surface of the crystals of galena, the latter has practically in no case suffered oxidation.

IMPORTS OF CHARCOAL PIG IRON.—During the fiscal year ended 30th June, 1898, Ontario imported from the United States 2,250 tons of charcoal pig of a value of $23,533. In 1897 Ontario imported from the same country 2,934 tons, and Quebec 2 tons, of a total value of $35,373.

Amended Yukon Regulations.

The recent changes in the gold mining regulations for the Yukon region, made by the Dominion Government are of some importance. They were made public the 12th instant and will go into effect in the Yukon twenty-four hours after the orders are received by the gold commissioner there. This will probably bring them into force about May 1st or soon later.

The first order is one that has several times been asked for; it provides for a yearly exemption of $5,000 gross output per claim, before royalty is charged on gold recovered. This will benefit the smaller miners and may stimulate prospecting. At any rate it will be a concession to a general demand which will doubtless be appreciated.

The second order provides that no government officer or other person employed by the government in any capacity shall hereafter be permitted to locate or record claims on mining lands in the Yukon. This will put an end to a practice of which much complaint has been made and which has amounted almost to a public scandal.

South African Blue Asbestos.

Mr. H. F. Olds read a paper on "Blue Asbestos" before a recent meeting of the English Institution of Mining and Metallurgy. Mr. Olds said:

Blue asbestos is a variety of that mineral found only in South Africa. It occurs in Griqualand West, and is mined over an area of 30,000 acres. It differs from the other varieties of asbestos, such as the Italian, Canadian, or Russian, not only in that it is blue in color, but in being considerably lighter. The asbestos is found in veins, seldom less than 2, or more often 4 to 5 inches wide, formed of closely compacted parallel fibres, which run from wall to wall of the vein without break or fault The grain is very fine, and even in the rough state the fibres are singularly distinct. Several veins are found, always in regular extent, and the fibre always lies at right angles to the sides of the deposit. The enclosing rock is a dark brown shale. The fibres are somewhat elastic, and easily separable by the fingers. The character of the rock varies considerably; some places are soft and some hard; the better quality asbestos occurs in the hard rock. Its color is a peculiar lavender-blue, and is caused by the large proportion of protoxide of iron it contains. Its composition is given as:

Silica	51.1
Protoxide of iron	35.8
Soda	6.9
Magnesia	2.3
Water	3.9
	100.0

The present output is over 100 tons per month, and there is apparently unlimited capacity for development and increased turn-out as the demand for it increases. Native labor is employed under European supervision. Very little skilled labor is required, the mining being mostly surface work, or by shallow adits driven in the sides of the hills. The smallness of the cost at which the article is obtained forms a striking feature, being only £5 per ton of 2,000 lbs. It has most of the qualities of white asbestos. It is uninflammable, rot-proof, and unaffected by atmospheric influecces, and is a non-conducting material. It is stronger than the ordinary asbestos. In "cobbing" it breaks away from the matrix rock with a clean fracture, and without any fragments of the latter adhering. The wool is capable of being spun into very fine yarn, of great tensile strength, which can be woven into netting, twine, ropes and cordage of all kinds. A composition is also made from the blue asbestos for rendering cement and other materials unattackable by acid liquors or vapors.

Power Transmission for Underground Pumping.

In a paper read before the Association des Ingénieurs de Liége, Mr. Paul Habets comes to the conclusion that underground pumping engines, whether worked by steam, hydraulic power, or electricity, are nearly equivalent as regards the consumption of steam. Methods with gearing are, however, more economical whenever a pumping engine is laid down of greater power than that actually required under ordinary circumstances, in order to provide for an increase in the quantity of water, in which case the pump does not work continuously, and if it be driven directly by a steam engine, its rate of consumption will increase in inverse proportion to the actual time it is at work. The advantage of reduced consumption, with suppression of the disadvantages caused by underground steam pipes, often compensates for the higher first cost of geared pumping engines. Hydraulic transmission has the advantage of great simplicity in the plant and its maintenance. The steam consumption of slow running compression engines, which may be fitted with very perfect valve-gear, may be reduced below 16½ lbs. per horse-power per hour; and with compression engines not consuming more than 14¼ lbs. per indicated horse-power, the consumption by the hydraulic pumping engines will be less than 22 lbs. per h.p. in water raised. Electricity requires motors of high speed, or of moderate speed if the generating dynamo be driven directly, while they are of short stroke and often less perfect as regards their valve-gear; but otherwise the generating dynamo should be driven by belt or rope, which is not, however, so favorable as regards the general useful effect. The management of dynamos would appear to be more delicate than that of hydraulic engines; but, on the other hand, the transmission of current in the cables is more economical than that of hydraulic engines; but, on the other hand, the transmission of current in the cables is more economical than that of water under pressure in the pipes, while cables are more easily laid than rigid pipes. Electricity, therefore, is better suited for long distances, while more readily lending itself to working appliances of all kinds; but the special conditions of each case will decide which means for transmitting power should be adopted.

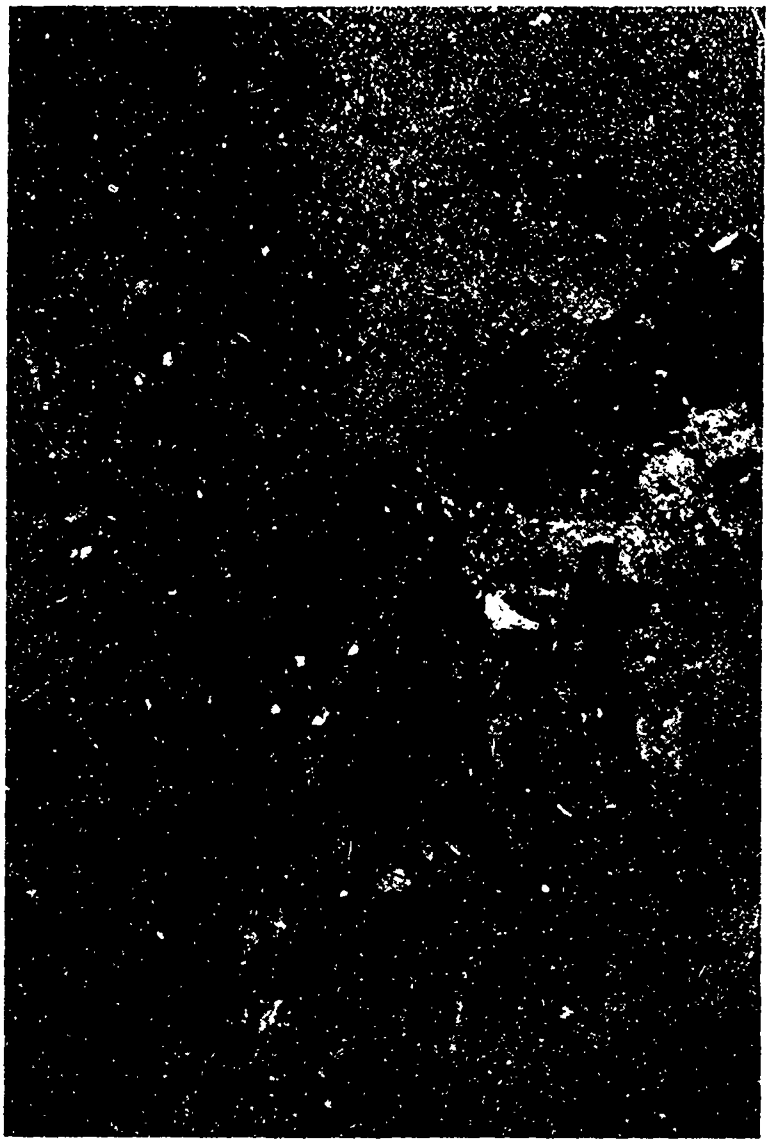
LARGE VENTILATING FAN.—The Capell fan has been selected for the ventilation of the Hoosac tunnel, and is being constructed by an engineer at Pittsburg, who is the licensee for the Capell fan in the United States. The fan will be 16 ft. diameter by 8 ft. wide, with with double inlets. The guarantee is for 600,000 cubic ft. of air per minute, which, irrespective of friction, means moving over 20 tons of air per minute, 13 cubic ft. of air weighing, roughly, one pound. The power is to be electric, supplied by the North Adams Electric Co., Mass.

LEGAL DEFINITION OF MINERAL.—The English courts have given a very comprehensive definition of the word "mineral." One of the notable cases is that of the Attorney-General v. Tomline (L. R. 5 Ch. Div. 750), in which Lord Justice Fry held that "the word 'mineral' includes every substance which can be got from underneath the surface of the earth for the purpose of profit." In the case of Nisbet Hamilton v. North British Railway Co. (13 Ct. Sess Cas. 4th series, 454, at page 461), Lord Adam said, "Common earth and sand are minerals."

A CHARTER has been granted to the Mikado Peninsular Gold Mining and Development Company, with a capital stock of $100,000. The directors are:—Walter Ross, Fred J. Bowman, J. H. Ross, D. T. Ferguson, and T. E. Birbeck.

MICA MINING IN CANADA.

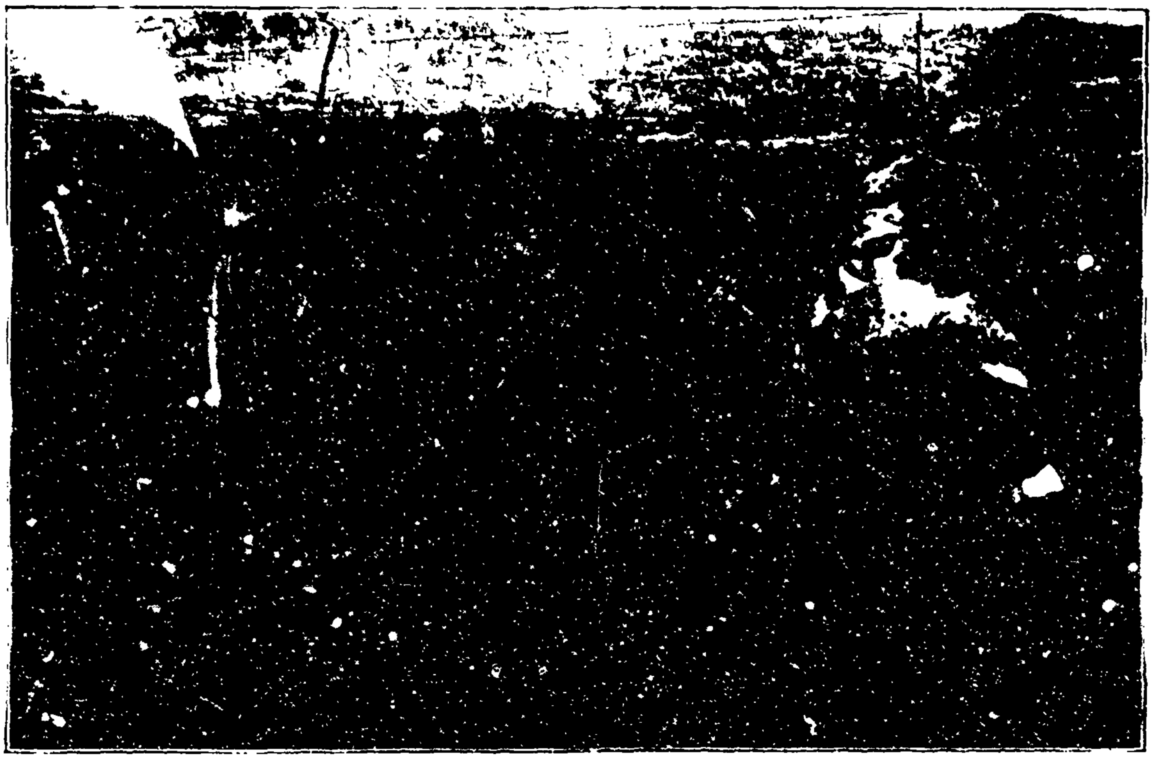
Hoisting Mica Crystals from Big Pit—Blackburn Mine, Templeton, Que.



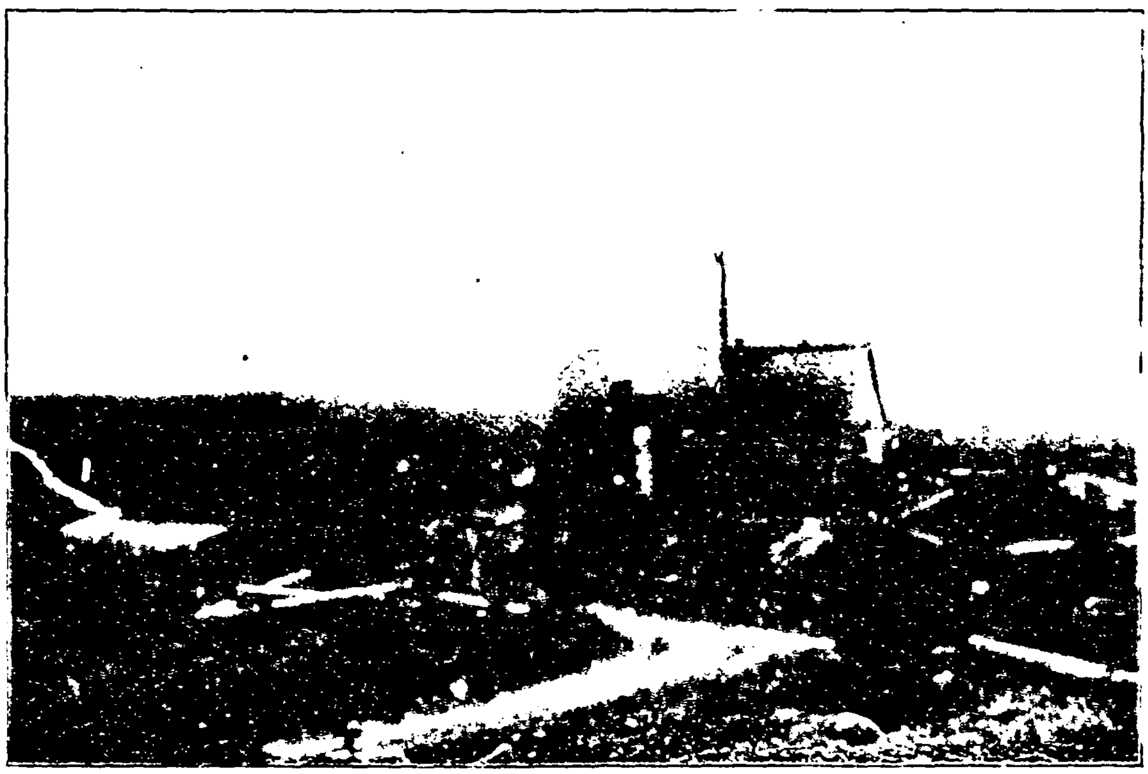
Underground Works—Blackburn Mine.

Wallingford Mica Mine—Templeton, Que.

Vavasour Mining Association—Open-Cast Mica Workings, Township of Hull, Que.

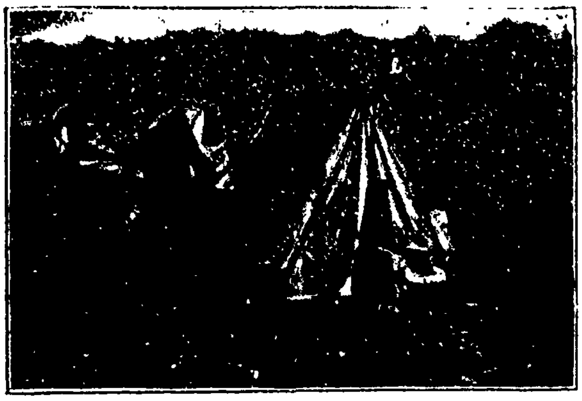


Big Pit—Blackburn Mine, Templeton, Que.



Shaft House and Works—Blackburn Mine, Templeton, Que.

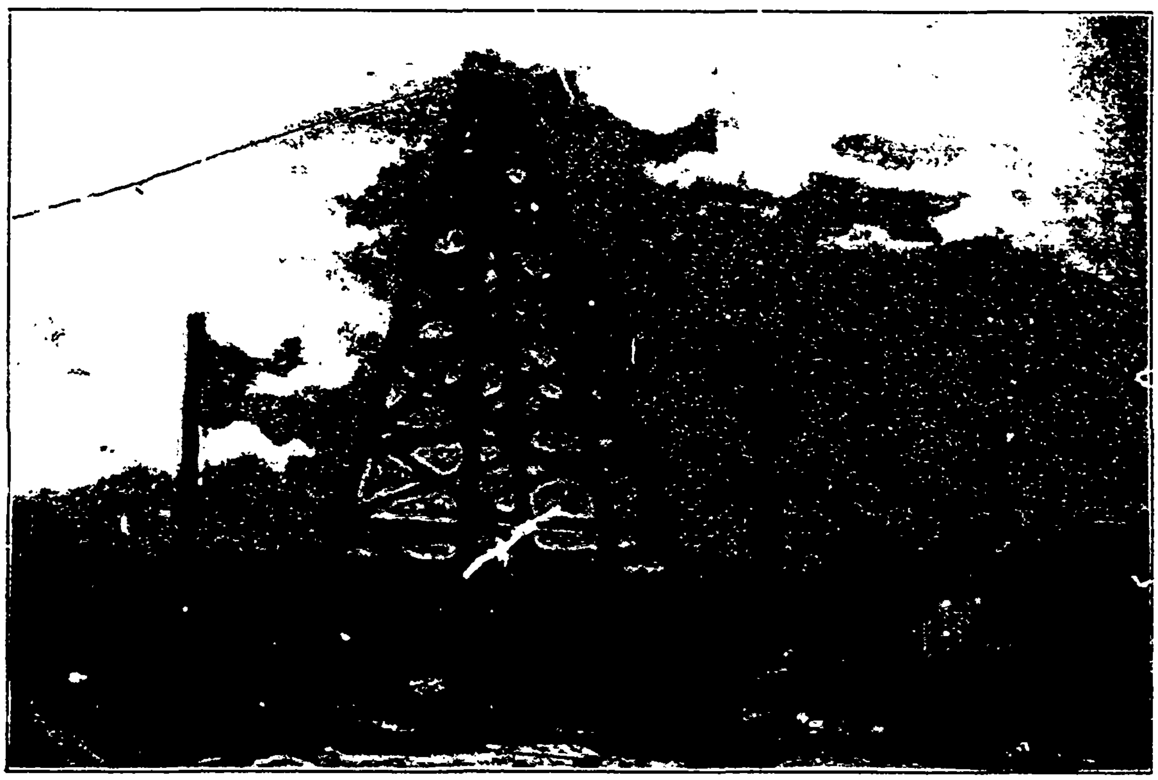
MICA MINING IN CANADA.



Mica Miner's Camp at Tete Juan Cache, B.C.

Cook House and Dining Hall, Tete Juan Cache, B.C.

Packing Muscovite Mica at Tete Juan Cache, B.C.



Hoisting and Conveying Plant—Blackburn Mine, Templeton, Que.

Notes on the Driving of Simplon Tunnel, Swiss Alps.

By Mr. Leopold Meyer, M.E., Ottawa.

(Read before The Canadian Mining Institute.)

In taking up as subject the driving of this tunnel, I do not intend to expound beyond measure the facts appertaining to it. I simply wish to give a general insight of the work, having had the opportunity of examining it and being acquainted personally with the engineers in charge of this gigantic work.

The object of the Simplon tunnel is to extend the line "Jura Simplon" by going through the Simplon Mountain and permitting the junction of this road with the Italian System.

The tunnel will be approximately 23,000 meters long. It starts at Brigue on the Swiss side, and has its outlet in Italy at Isellen.

The project designed, and now in course of being carried out, work having started two months ago or so, provides for the construction of two parallel tunnels which shall be joined by cross-cuts driven every 100 meters. The object of this second tunnel is to improve and facilitate the ventilation of the tunnels during the course of the work as well as after the completion.

The firm, Brandt & Brandan, of Hamburg, which is well known for having driven different tunnels such as "Arlberg," "Caucasus" and part of the "St. Gothard," has taken the contract *en bloc* for the work. In five and a half years the two tunnels must be completed, masonry work finished and tracks laid down. For each day of delay after this the contractor shall have to pay a fine of 5,000 francs ($1,000). On the other hand for each day gained on the agreed time he shall receive a bonus of 5,000 francs. The contractor feels satisfied that he can gain half a year, and I must say that the measures taken by them seem to fully justify these hopes.

It is rather difficult to realize what preparations have been necessitated by such an enterprise. Thorough soundings, by borings, have been made of the whole mountain, which have revealed to the contractor the exact section and what rocks he has to deal with, and to provide himself with the necessary apparatus.

Yet the problem to be solved is very complicated, and can be classi ed as follows. We shall review it rapidly under the following headings:

1. Surface installations.
2. Mode of work for the driving and power used.
3. Ventilation.
4. Refrigerating plant.

Surface.—A small town has sprung up at each end of the tunnel To describe one is to dercribe both, for the tunnel has been started from both sides, on the Swiss side at Brigue, and on the Italian side at Isellen.

Besides dwelling houses for the workmen, a dynamite factory has been built, on account of the great quantity of explosives necessitated by such a colossal enterprise.

The principle of all the power employed is the use of wat r under high pressures. Where natural falls can be utilized under the natural head of water, it is used as such. But for the drills working by hydraulic pressure a series of compressors have been put up which give pressures at the drills of 50 to 150 atmospheres. This corresponds to 2,750 lbs. per sq. inch.

It is remarkable to notice with what ease such huge forces are transmitted without leakage at the joints or bursting of pipes.

Mr A. Brandt, the head of the firm, works with machines of his own designs, which are made by Seilzer Brothers, of Wentlrthur, who are very skillful and conscientious constructors.

I would strongly advise all persons interested in such works, and who have a chance to do so, to pay a visit at the work shops of this firm, which owe their origin to private enterprise, in a country without coal or iron and having as only advantage on the other constructing firms of the world, the qualities of industry and heartiness to work which are the distinguishing features of the Swiss people. In a small town, without apparent prospects, the Seilzer Brothers have given rise to an industry which employs more than 3,000 men, men to whom they are insuring a life prosperous and happy.

The compressors used by Mr. Brandt are made very carefully. The principle is quite simple. The engines are double or coupled; on each side are two steam cylinders, one high pressure and one low pressure. On the same axis, on each side is a differential or force pump which forces the water directly to where the force is used, with an intermediate so-called accumulator, which is only a safety valve, which is laden with weights to obtain the required pressure. If the rock is very hard additional weights are put on the accumulator of which the reaction or throbs are checked by strong steel springs.

This enormous pressure is obtained without noise and the power is taken to the workings without the observer being able to detect the least abnormal noise.

I think that the success of these apparatus is mainly due to the excellence and perfection of construction.

Therefore, in the surface plant of machinery, the power is generated according to those principles. High pressure everywhere even the boilers. The boilers are small and yield enormous quantities of steam at very high pressure, which is a principle eminently economical and practical. None of those huge boilers with low and costly pressure. This principle of high pressure is apparent everywhere and seems to influence the workmen, who also appear to work under high pressure.

The power is received at the different working places to work the ventilating fans and drills. We are going to consider these and say a word about the working of them and show the efficiency obtained from them.

Work Carried on in the Tunnel.—The rock is attached by rotating drills worked by hydraulic pressure. A light frame on a carriage carries to the breast work a horizontal column with a piston, on which two drills are attached. The whole is arranged so as to take up as little room as possible. It is like a closed umbrella which is opened when the carriage has reached the working place.

Then the column is put in place and wedged in. A tunnel of small dimension is always first driven. This is subsequently widened to the size of the finished section.

When the column is set in place, water under pressure is introduced through a small flexible copper pipe of less than a fifth of an inch. This acts on a large piston which wedges the column in an immovable position.

The drills proper, which can be moved on their axes in all directions, are then fixed on and the bit attached; the drill is then put under the pressure as explained before.

The bit is made of hollow tube through the interior of which passes the waste water. In this way it is used to clean the hole. The bit is made of exceptionally hard steel and has three teeth which tear the rock. When the holes are completed the machine is taken away and the blasting is made. Here, a point which may be of use to the miner may be noticed. The quantity of dynamite used is so large that the rock is not only torn asunder, but powdered and almost burnt.

No savings are made of explosives. This is an essential point when time is the real factor.

The mode of working of the drills is very ingenious. The apparatus as a whole is simple. The movement of rotation of the tool is obtained by two small hyraulic motors of which the dead centres are cranked at 90°. The forward motion is given by the water under high pressure, acting directly on a large piston, placed below the bit.

The backing motion is obtained by turning a valve. The workman in charge of the machine has complete control of it and can easily take off two of them. I had the opportunity to work one of these machines myself and succeeded in obtaining in an ordinary granite, an advance of 21 feet a day in a drift of a section of 7x7 feet.

The changing of the bit is very rapidly made, and the lengths are graded to obtain the maximum advance.

If the sum spent in getting out of the "debris" could be saved, an economy of time of 50 per cent. could be effected.

Here Mr. Brandt proved himself equal to the occasion. He has not suppressed the carting away of the clearings, but he has succeeded to effect it simultaneously with drilling and blasting. On one side of the tunnel he has placed a large pipe with water at high pressure. This pipe is about ten inches in diameter. At the end, near the breastwork is a fixed elbow with a flattened conical nozzle, directed in the axis of the rails. Immediately after the shafts have been fixed the whole of this apparatus is covered by the debris, the quantity of which however is a minimum on account of the large quantity of dynamite used. The valve is now opened, and the enormous volume of water under pressure sweeps the fallen rock out of the way, clearing the rails and breastwork sufficiently to allow the drills to advance and resume work. The clearing goes on therefore below the drills and to their right and left while they go on with their work.

While this small opening tunnel is being driven forward, other apparatus are at work behind widening the section to the required size.

But the organization of the work is such that everything is effected systematically without disorder. Each section works without interfering with the other. One goes on unimpuled over the other, and the masonary work advances without interruption night and day.

It is interesting to see entering the tunnel simultaneously, the material for the timbering of the temporary drift, the bricks and cement for the masonary of the finished section and at the same time the debris of the blasting are carted out. And these do not in the least interfere with one another. The work follows its normal and regular course; such is a bee hive where every individual has its work cut out and knows exactly what is to be achieved.

Ventilation.—It is easy to conceive that ventilation in such a work is of first necessity and importance. In spite of the two tunnels, an energetic artificial ventilation has to be resorted to.

Mr. Brandt has solved the problem as follows:

He uses high speed fans, not less that 3,000 turns a minute. The air forced by this fan is received by a second and forced to a third and so on. By this means, with a series of apparatus comparatively small and unobstructive, he has succeeded to provide enormous quantities of air at suitable pressure. This is another of those simple ideas which give the best results.

Refrigeration of the Workings.—This is another point which is a source of worry to the contractors. It is the heat which is met with at distances of 10,000 feet underground. A temperature of 130° Fah. is expected. Then the question comes up, how is the work to go on in such temperature.

The driving of the St. Gothard tunnel has demonstrated that beyond a certain temperature few temperaments can resist and the sick lists attain alarming proportions.

It is intended to solve the problem as follows: After each shot, a shower of ice-cold water derived from the glaciers, shall be sprinkled on the breastwork. As water absorbs a large amount of heat the temperature after this operation shall be considerably lowered.

Also, the air from the fans will be made to pass through coolers and over material absorbing moisture. For, it is not sufficient to send cold air where ventilation is needed, but this air must also be dry. Experience has shown that excessive moisture has a depressing effect on the men.

I think that these few lines, written as thoughts came, will give some idea of an enterprise of first magnitude, by pointing out in a brief way the difficulties to overcome, and the means taken to do so.

If some members of the Institute should happen to have the opportunity of visiting this work, it would cause me great pleasure to give them letters of introduction to the contractors, whom I know personally and with whom I have worked and learned.

An Occurrence of Free-Milling Gold Veins in British Columbia.

By Wm. Hamilton Merritt, F.G.S., Assoc. R.S.M., &c.

(Read before The Canadian Mining Institute.)

The free milling gold ores have not as yet been developed to the same extent as the smelting ores in British Columbia. Indeed it might very correctly be said that (excepting possibly the "Poorman," near Nelson,) until comparatively recently the "Cariboo" at Camp McKinney was the only mine that had been constantly at work for some years back on a free milling gold ore of sufficiently high grade to yield its owners handsome dividends.

Somewhat similar conditions prevail about 25 miles from Camp McKinney in a locality known as the Fairview Camp, and while it cannot be said that developments up to the present have demonstrated ore-shoots as extensive, and perhaps as high-grade, as on the "Cariboo"; yet there is high-grade ore, there are strong and permanent veins, and I think I may very properly take a portion of this camp as a type of the occurrence of free milling gold veins in British Columbia.

Intrusive granite appears to be the rock most intimately connected with the free-milling gold ores in the southern part of the Province, that is to say, perhaps not of necessity as forming the walls of the veins, but, as in Nova Scotia, occurring in the immediate vicinity.

Here in one part of the camp in question an immense mass of intrusive granite forms the major part of a mountain. This is bounded on the north-east by a schistose quartzite (microscopic examination, referred to later, would allow it to be classified as a mica-schist).

The schistosity of this rock is parallel to the edge of the granite. A couple of strong quartz veins occur in the schists running with them. The veins have been opened at various places along a length of a couple of miles and are found to follow in a general way, and sometimes to be quite close to, the edge of the granite.

Here and there protrusions of the granite mass have caused disturbances and have thrown the veins, in well-defined faults, to the north-east. Fig. 1 is a photograph of one of these faults. Where the faulting occurrs the schist is also much twisted.

The veins above alluded to vary from 2½ to 12 and 15 feet in thickness, and so far as their width and permanency go they are everything that can be desired. The mineralization is similar to that of the Camp McKinney veins, consisting of varying proportions of iron pyrites, galena, zinc blend and gold.

A number of mill runs showed that the free milling value was some five times that of the value of the concentrates obtained per ton of ore milled, but at the same time a considerably larger value, per ton of ore milled, escaped in the tailings than was caught by the Frue vanners; indeed the loss in the tailings in some trials was nearly half the value of the bullion caught in the battery and on the plates.

In higher grade ore the tailings sometimes ran to $4 and $5 a ton.

The loss in the tailings is probably carried over by slimed concentrates. This is a matter that will bear careful watching in the development of the Fairview and Camp McKinney camps, and it would be no matter of surprise to me were it found that all the tailings run away from the Cariboo mill would bear treatment. Cyanide tests have given an extraction of 90 per cent. gold and 75 per cent. silver of both concentrates and tailings, the samples tested being from above mentioned test runs.

When running on a pay grade of ore the yield of concentrates is about 2 per cent., and their average value is about $70 a ton. They have been generally shipped to the Tacoma smelter.

As is usually the case elsewhere, the rich places appear to occur as shoots, and in the claim about 100 feet was quarried along the outcrop yielding results running well into the double figures, and from a width of over 12 feet in places.

I understand that the part of the vein which paid so handsomely on the surface is being opened in depth.

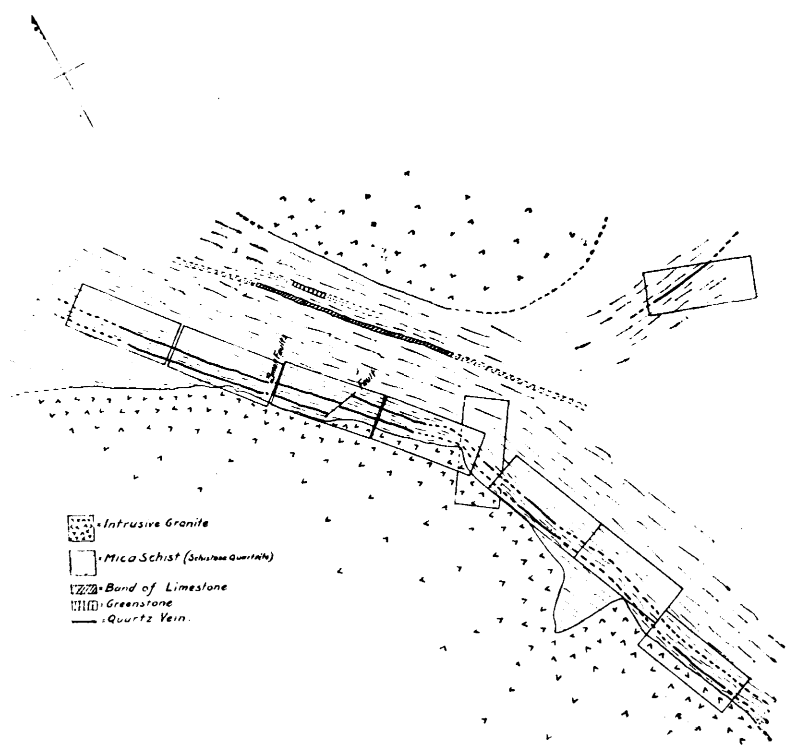
It should be mentioned that while most of the veins have been developed in the schistose rock, yet there are cases where veins have been opened in the granite. In one of the latter instances ore was obtained which yielded upwards of $30 a ton in the mill, but it was reported that this vein was very irregular and all the pay ore mined out.

An example such as this is of value to offset the too often indulged in depreciation of a vein where the bedding is parallel to it, and for which reason it is sometimes held that it is not a fissure vein, though indeed the bedding or schistosity may have been formed subsequently to the original fissure.

The following are the descriptions of the granite and schistose quartzite (or mica schist):—

Biotite Granite.—Rock light in color, of medium grain and somewhat porphyritic, owing to the biotite being as phenocrysts scattered rather sparsely. The section shows granitic quartz with the usual inclusions; orthoclase rather fresh looking; plagioclase which is much altered, and shows much secondary mica in small flakes all through it. The plagioclase is in excess of the orthoclase and the two are predominant in the rock. No accessory constituents are to be noticed in the section.

Muscovite Granite.—Resembles the above closely in color and general structure, but it is finer grained and is without porphyritic crystals of mica. The specimen was taken from the same intrusion as



The geological features of the portion of the camp above alluded to is the more immediate object of these notes. The accompanying sketch map shows the veins following the edge of the great granite mass. It might appear that there were at least two series of upheavals—the first may have caused the fissures in which the veins were deposited, and the second, accompanied by constant great pressure, has produced the faults in the veins and also the schistosity parallel to the strike of the vein and at right angles to the evident thrust from the mountain of granite.

This is another example of the so-called "bedded vein" structure, but in this case they are as typical "fissure veins" as it is possible to imagine.

This is shown much more distinctly again in another strong vein which I have included in the sketch map further to the east. Here the vein occurs in a darker schist, but on microscopic examination its wall rock shows identical features to the wall rocks of the main system of veins beside the great granite mass. In this latter case, however, it is clearly shown in the rock-section (described later on) that the original bedding has been disturbed by pressure and that the present bedding has been set up at some 50° from the original bedding, the present bedding being parallel to the vein.

the above, but nearer the edge, where it has cooled more rapidly. The rock is more altered than the one just described. The microscope shows much muscovite, most of which seems to be derived from the felspar. The little flakes show very high polarization colors; granitic quartz in normal proportion; felspar present in large quantity, part of it seems to be orthoclase and part probably plagioclase, but very much altered, the muscovite being all around and through it. Some small scattered grains of ferric oxide, in the centre of some of which pyrite is visible where decomposition has not yet oxidized the whole mass.

Mica Schist ("Schistose Quartzite").—The specimen represents the general character of the formation in which the veins occur along the edge of the large granite mass. The rock is a rather fine and very evenly grained mica schist. The quartz grains are rather irregular in size, but in general they are very minute. There is an abundance of both biotite and muscovite, the two kinds intimately mixed and forming pretty continuous strings. Both are in fairly well defined crystals, the former in small oblong prisms and the latter in long needles. Scattered quite profusely through the section are irregular pieces of pyrite, considerably decomposed, and with their longer axes also usually following the direction of schistosity.

Mica Schist.—This specimen represents the rock in which the vein to the east occurs. The constituents of this rock are identical with those of the last described and they have probably both been formed together, but this rock is less evenly grained, as it shows evidence of having had another bedding previously and the present bedding is naturally therefore not so perfect. The rock is stained dark with iron oxide and microscopically has the appearance of a fine-grained gneiss. It is seen to be made up of dark layers alternating somewhat roughly with lighter and thinner layers. Under the microscope the darker bands are seen to be made up of fine grains of biotite and the lighter of irregular rounded grains of quartz. There are also some angular grains of microcline and other triclinic felspar to be seen occasionally throughout the section, and disseminated grains of iron oxide with pyrite in the interior in cases where decomposition has not changed the whole mass.

This section shows by the direction and arrangement of its mica constituents that there has been a previous bedding of the schist inclined to the present bedding at an angle of just about 50°. The original schistosity may then have been parallel to that of the previously described specimen of mica schist, and the present bedding subsequently formed by heat and pressure at an angle. The difference of strike of the two schists, and of the veins occurring in them, is about 50°.

The Adjustments and Control of the Stamp Mill.

By Prof. Courtenay De Kalb, School of Mining, Kingston, Ont.

(Read before the Canadian Mining Institute.)

In submitting this paper it is necessary to preface it by saying that I am not aware that I will be able to advance a single new fact or proposition, but a discussion upon even so hackneyed a theme as the adjustments of the stamp mill may prove of some value by calling the attention of millmen anew to the importance of guarding well the minute details of practice, and of adapting their treatment to the peculiarities of the ore with which they have to deal. This may seem so obvious a necessity that the mere statement of it may strike some of you as being superfluous. But against this I must urge in my defence that it is a comparatively rare thing to find a stamp mill either in its design or management exactly suited to the ore passing through it, except where a mining belt yields (as sometimes happens) practically identical ores over large districts, and where some millman of judiciously investigating habit has worked out his problem for the benefit of himself and his neighbors. But ores from mines in the same district, no matter how restricted, nor how similar may be their appearance and geological setting, are very seldom identical in character. They may even vary greatly at different points in the same mine, and the millman who ignores these variations, however slight they may seem, will find fluctuations in his extraction, for which in many cases there might be a simple remedy if he knew how to determine the right one and apply it.

The first error that is usually committed in faulty accommodation of the mill to the ore is chargeable to the recklessness of the mine owner in ordering "a stamp mill" from the manufacturer. He sometimes does specify the weight of stamps he desires, without as a rule having the remotest idea why he wants any particular weight, except that he frequently assumes that capacity is the great thing to strive for, and he reasons that heavy stamps (if not too heavy on his purse) must necessarily be superior, forgetful that in amalgamating mills there are two distinct capacities to be aimed at, viz., crushing capacity, and extracting capacity. The economical line between these two is the one that will be of the greatest importance to his company in the payment of dividends. But in ordering a stamp mill there are many considerations besides weight of stamps to be taken into account, such as the width and depth of the mortar, length of feed hole and character of automatic feeder, number and positions of inside plates, shape of discharge lip, slope of screens, etc. These are points which cannot be guessed at if the highest practical efficiency is to be attained. Obviously then a very considerable ore body should be in sight, not simply as a surface outcrop, but well explored below ground, so that its character may be fully known. The next step should be to make practical mill tests on average lots of the ore, the *average* involving not only value, but character of the ore. One mill test will commonly be insufficient to determine the design of mill required. If the extraction is well above 90 per cent. of the gold available by amalgamation the test may be regarded as ample so far as the mortar and stamps are concerned. The millman should then by careful attention to the finer adjustments reach a very high extraction. But if the test falls below 90 per cent. of the gold which should be saved by amalgamation, samples, identical with those first tested, should be experimented with in another mill of different design as to details of mortar, etc If the difference in the design of the two mills was considerable, very useful deductions may be drawn from these tests. Manifestly such testing as this is expensive, and the outlay may amount to no insignificant percentage of the cost of the mill finally ordered, but the propriety of incurring such an expense should not be judged of on that basis, but rather as compared with the loss in gold which would have gone irretrievably to the tailings dump had not these precautions been taken.

Although the design of mortar is a subject apart from that under discussion in this paper, it may be briefly pointed out that the two chief considerations are its width, measured at the discharge lip, and its depth from that line. Depth can be modified to a considerable extent by the simple device of clinch blocks, but width is absolutely fixed. Other things remaining the same, increase of width reduces scour on inside amalgamating plates, and lowers crushing capacity, or, what comes to the same thing, it lessens the discharge of relatively coarse material. Thus to some extent it increases the amalgamating power of the mill, more particularly on account of the improved efficiency of the inside plates. If the greatest possible amalgamation of gold is sought to be accomplished inside the battery it is always safer to err on the side of width than narrowness, for the millman can accomplish more by his adjustment with a relatively wide mortar Likewise regarding depth it is safer to adopt a shallow instead of a deep mortar, for shallowness can be remedied, but its opposite imposes an unalterable condition. Depth favors fine crushing and high amalgamation at the expense of capacity.

The length of feed-hole is also important. Many mortars are now made with a feed-hole little more than one-third the length of the mortar. This imposes a concentration of the feed at the central stamp This can scarcely be regarded as other than a serious defect in mortar design. Though differences of opinion exist upon this matter, it can hardly be questioned that the central feed results in a preponderance of ore under the central stamp, and though this is soon worked off to the sides this stamp is, during a large part of the time, falling a less distance with each drop, thus reducing its crushing efficiency, and thereby lowering the output of the mill. The ideal condition is a uniform feed to each of the five stamps of the battery, and if the ore fed is previously reduced by rock breaker to a proper degree of fineness, so that the work of the rock breaker is not imposed upon the stamps, there should be no trouble experienced with banking of ore at the battery ends. In passing it may be noted that, for purposes of amalgamation, the proper size of ore to be fed should be determined by experiment. Capacity is of course increased by feeding smaller stuff, and this may result in decreased saving of gold, but the remedy for this, up to a certain point, lies in those adjustments which either limit capacity, or, while hastening barren gangue through the screens, retain the gold longer in the battery. Where the gold in the free state is not exceedingly fine, such adjustments are easily possible. In any case, since the manner of feeding plays an important part in the efficiency of the stamps, there would seem to be no reason why a mill should be tied to a central feed, since central feeding can, if found desirable, be accomplished just as well through a long as through a short feed-hole.

The weight of stamps, another fixed condition, should be carefully considered. The crushing power of the stamp depends partly on its weight, and also, other things being equal, on its momentum. Now there is a practical limit, which is a very narrow one, for the height of drop of heavy stamps. A lighter stamp with higher drop will acquire a momentum which will develop equal crushing capacity. While of course the element of time enters into the calculation, this sinks into comparative insignificance where the difference in height of drop is no more than two or three inches, and the greater flexibility as regards adjustability of a mill which has a possible range of say 4 inches in drop as against a mill with a range of 1½ to 2 inches is an advantage of no small consequence. An 800 lb. stamp has all this in its favor over a 1,000 lb. stamp. There are undoubtedly many cases in which the greater weight is desirable, but the working condition of such a mill are so much more limited that its adaptability to the ore should be very definitely known before venturing thus to tie the hands of the millman. Where doubt exists lighter stamps should be chosen.

As mills are commonly constructed, the slope of the screen is also fixed. The vertical position is rarely adopted, and for a good reason. It is perhaps the crudest and least economical method of limiting discharge from the battery. Screens should be set sloping, and the angle should be capable of a certain amount of adjustment. There would be no difficulty in effecting a light seal around the edges of a screen under such circumstances, and the millman would thus be enabled to adjust his discharge to the quantity of water used with far greater nicety, giving him added control over the fineness of crushing.

The adjustments of the mill are, height of drop, number of drops per minute, height of discharge, kind of screen and size of mesh, and quantity of water. The order of drop of the stamps is also a matter of importance.

The height of drop can be adjusted within certain limits, dependent upon the design of the mill. With an increase of height a longer time will be taken in falling, and a proper interval must be allowed for the rebound and settling back of the stamp before being again lifted by the cam. The speed should be adjusted to this, so that no more than the necessary interval is allowed in order that the stamp may perform its maximum duty. Prolongation of the period of rest, however, may be beneficial at times by permitting the heavier particles to settle, keeping them longer in the battery and thereby insuring a finer crushing of this material. If these particles contain gold, as is not unlikely to be the case, an increased saving by amalgamation will result. But care must be taken that such increased recovery of gold is not economically overbalanced by a reduction in total output of the mill. On the mechanical side the limits of this adjustment lie between a position of the tappet so low down on the stem as to incur the danger of "camming," and the opposite position at a height so great that the cam will not strike it until it has completed too much of its revolution, causing a risk of breaking the cam arm on account of the high speed at which the cam begins to lift the tappet. Further changes in the height of drop may be accomplished by substituting new cams designed specially to favor the object in view.

Height of discharge is to a limited extent independent of height of drop. The general practice in the best gold mills today is toward such a height of discharge that the stamp is never lifted entirely out of the water. This avoids any violent splashing of the pulp against the screens which not only retards the escape of the crushed ore, but occasions an undue wear of the screens. The regular pulsation of the pulp when working as above stated keeps the ore in suspension better than when the splash is violent, the coarser particles are not lifted so high above the dies, and the finer particles are afforded a superior opportunity to escape by the gentle flow of the waters over the screen surface. The resultant crushed product will be of more uniform size, and for the degree of fineness and crushing capacity sought, the inside amalgamation will be higher when this method is followed. In general it may be said that height of discharge should be increased in proportion as the ore contains either pyrites or harder portions of gangue locking up gold. On the other hand if the "sulphurets" are of such a character as to promote "sickening" of the mercury, lower discharge will be necessary.

One of the most delicate adjustments of stamp milling operations is in the quantity of water fed to the battery. It should be uniformly distributed to the several stamps, and not delivered at one point. There should always be enough to make a pulp sufficiently thin so that the stamps may keep all of the material in the battery in motion. Any tendency to banking is fatal to good work. Addition of water beyond this point facilitates rapid discharge. If there is a considerable quantity of gold in the softer portions of the ore, thinning of the pulp will so hasten its escape that losses may be occasioned. On the other hand, if the softer portions of the ore is relatively barren an excess of water will so effectually discriminate between it and the harder ore that it will be hurried through, leaving the stamps free to do their work where it will yield the larger economical results. As a general thing the quantity of water should be increased with greater height of discharge, but these two factors in milling should bear a relation to each other which should be very carefully determined for each individual ore in order to insure the maximum efficiency.

The slope of screen has already been mentioned. The difference of a degree will make a great difference in the rate of discharge. It will often make an even more important difference in the life of the screen. Very little dependence should be placed on the slope or the mesh of the screen for regulation of the discharge. This should be accomplished through other adjustments. The screen in a stamp mill, moreover, should not be regarded too much in the light of a sizing device. Regulation of size can be very neatly and accurately accomplished by suitable height of drop, height of discharge and quantity of water. If these are properly adjusted the screen should have comparatively little to do in sizing the pulp, serving mainly to arrest a relatively small amount of oversized stuff which has been thrown too high. This is particularly true where the stamps are set so as to drop in water instead of upon it.

Concerning the kind of screen and character of openings opinions and practice differ widely. It might almost be said that these have changed arbitrarily like fashions, with scarcely more justification. We have woven wire screens (the old standard), round-punched tin plate and Russian iron, diagonal slot and horizontal slot Russian iron and steel sheet, both punched and cut. The woven wire screen gives the larger area of open surface, and accordingly facilitates rapid discharge. Where the adjustments are so made as to depend least upon the screen for sizing, there can be no doubt that this is the best kind to adopt, for in such a case a very large amount of pulp thrown against its surface is presumably ready to be ejected. The flow of the pulp over a surface of this kind is also considerably retarded, which likewise promotes a free discharge. The outflowing pulp will therefore contain a relatively larger percentage of coarse material. Crimped steel wire is always to be preferred, except where the battery waters are corrosive from high acidity. Brass wire, and certain alloys, such as aluminium bronze, would then be found superior. These will absorb more or less amalgam, and the worn-out screens will ultimately be melted into bars and sold to refiners. The other forms of screen are manifestly used with a distinct view to their function in sizing the pulp. There may be cases where such sizing and restriction of discharge as they produce would prove more economical than the accomplishment of the same result by other means. The point is one to be decided with great care in each instance. The diagonal slot, ratio of open and blank areas being the same, will yield a faster discharge than the horizontal slot screens, and the cut metal will pass pulp more readily than punched or "burr" slot. It appears also that the "burr" slot is adapted only to mills where the stamps fall on the surface of the pulp, producing a violent splash. Round punched tin plate, which is usually prepared on the ground, is rarely advisable, except as a means of using up accumulations of suitable material which would otherwise go to waste. Round punched Russia iron is recommended by some manufacturers, and is used to a considerable extent in Australia, but the author has no knowledge as to its efficiency.

The order of drop of the stamps exercises an influence on the crushing capacity of the mill, on the amount of scour of inside plates, and on the wear of screens. For high amalgamation the order adopted most generally in the West is 1, 4, 2, 5, 3, and it is perhaps the best for all around purposes, though it has a slight tendency to crowding material somewhat away from stamp No. 1. Another good order is 1, 5, 2, 4, 3, which, however, tends to bring a slight excess of battery sands toward the middle stamps. The orders 1, 5, 2, 4, 3, and 1, 5, 3, 2, 4, both produce a very uniform distribution of sands in the battery, giving high crushing and discharging effect, at the cost of larger scour on inside plates with increased wear of screens. As an example of a bad order, 1, 4, 2, 3, 5 may be given, an order which rapidly tends to banking under stamp No. 5.

By control of the stamp mill is understood the maintenance of the same degree of pulverization, once the proper conditions have become established. Manifestly the mill must be adjusted to suit the ore, but on the other hand the ore must be adapted to the milling conditions. It is a great misfortune to have the ore which comes to mill frequently varying in character, so that either new adjustments must be made or loss allowed to take place. Such irregularities happen far more frequently than is necessary at many mines. The mine foreman can often adapt his work to the changing character of the ore (where the relative quantities of the different sorts of ore do not vary too erratically) so as to ship to mill at all times approximately the same mixture. Where the conditions of mining forbid such selective work the difficulty may be overcome, at least to an important extent, by crowding the production of ore ahead of the needs of the mill and "stocking" this in horizontal layers in large square or rectangular bins with flat bottoms. On removing the front of a bin thus "stocked" the material will fall down very uniformly mixed, so that the ore going to mill will present no wide differences in character.

To maintain the same degree of crushing it is necessary that the height of discharge lip above the die should follow the die down as it wears, which can only be accomplished by starting with chuck blocks under the screen so that these may be successively removed. The tappets will also require re-setting at intervals to preserve the same height of drop of stamps. Care must be observed likewise to prevent "cupping" of shoes and dies, that is, an unequal wear forming hollows and prominences. No mill is doing efficient service where "cupping" is permitted. The remedy of course exists in shifting the dies methodically so as to insure a uniform wear. There is always a tendency to slipping of tappets on the stems which should be watched. The use of set screws for attaching tappets has been almost universally discarded in favor of gibs and keys. When properly tightened up they will rarely slip, but the danger must not be overlooked. The rotation of the stem is supposed to promote uniform wear of shoes and dies, but its importance is perhaps somewhat over-estimated. Still, as stamps are made to be revolved, it is the duty of a careful millman to see that they do so, and that they do it uniformly. The number of lifts for one revolution of the stem depends mainly upon the lubrication of the cam arms, but, in general, things are assumed to be going well when one revolution is accomplished in from six to ten lifts. A tendency to a reverse rotation on dropping, if occurring with each drop throughout the revolution, indicates unequal wear of the stamp guides, which means that the stamp is not falling perpendicularly, and hence is not giving its full crushing effect. If the tendency to reverse rotation occurs during only a part of the revolution it indicates serious "cupping," which the millman should have discovered previously.

Difficulties in crushing are too commonly ascribed to some peculiarity of the ore, and the millman is thus allowed an easy escape from responsibility. The fact is that all ores crush practically alike, so long as the crushing conditions remain unchanged, granting that the material is discharged as soon as it has been reduced to the requisite degree of fineness. Bearing this in mind, it is easy for the millman to make his adjustments so as to produce the requisite results. The matter of course is complicated by the necessity of securing a high inside amalgamation of gold, and there is altogether too great a tendency to neglect the possibilities of amalgamation in the stamp mill, and resort to devices for outside amalgamation, which are frequently less efficient, and add largely to the costs of extraction. The stamp mill should be looked upon as primarily a combined crusher and amalgamator. As a crushing machine it is mechanically crude, and wasteful of power. For simple crushing there are appliances far more efficient, particularly where large quantities of ore are to be treated. But in its proper sphere the stamp mill has no rival, and the exceeding delicacy of the adjustments possible for the production of specific results will be hard to attain by any other machine.

As a single example of what may be accomplished by slight modifications, the author may cite a test made some time ago in his own practice. The ore was being crushed for subsequent treatment by the cyanide process. The height of drop was 6 inches; height of discharge 5½ inches; 102 drops per minute, with copious (but unmeasured) water supply; stamps weighing 850 lbs.; screens used, No. 20 mesh. A battery was set so that the stamps dropped 7¼ inches, with discharge 7½ inches, and the water supply slightly reduced. The accompanying sizing curves show the difference in the character of the resultant pulp, curve A representing that produced originally, and curve B that obtained after making the changes mentioned in adjustment. It will be seen that in curve A 35.48 per cent. of the pulp was included between the sizes from No. 20 to No. 50 mesh, while in curve B this has been reduced to 12.61 per cent. Again in curve A only 28.83 per cent. lies between No. 50 and No. 150 mesh, which has been increased in B to 47.68 per cent. The ratio between the sizes on Nos. 50 and 150 mesh is approximately as 2.49 : 1, a difference quite wide enough. The more this ratio is increased the more densely will the sands pack in the leach tanks, thus opposing a free percolation. When the quantity on No. 40 mesh is large, with a ratio to No. 150 mesh ore as 4.02 : 1, the difficulties of good extraction by cyanide are increased. The excess of fines, amounting to 8.36 per cent., is not as deleterious as might at first appear, for subsequent treatment has shown that about 70 per cent. of these can be separated in a granular and leachable form. It is worthy of note that such a result could not have been obtained by using finer screens without greatly lessening the capacity of the mill, and causing excessive wear of the screens themselves. The product, moreover, would have been dissimilar. To further show what has been accomplished in this case ratios were computed in which the comparison is made between the two methods of crushing, taking into account the assay values of each size of pulp and the total weight of ore of the corresponding sizes. Thus we are enabled to compare the actual amounts of precious metals going with each size of pulp. For convenience in plotting, to the ratio $\frac{1}{x}$ in each case x is increased by 1, making the ratio $\frac{1}{x+1}$. The results are presented graphically in Plate II.

Plate I

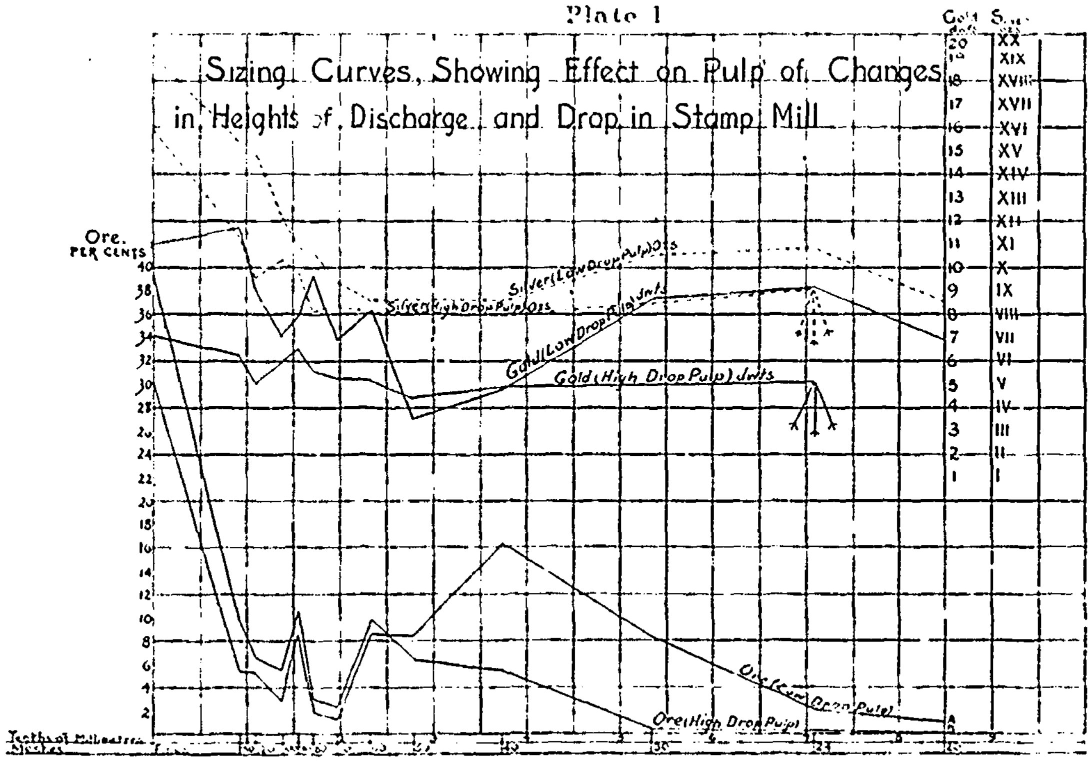
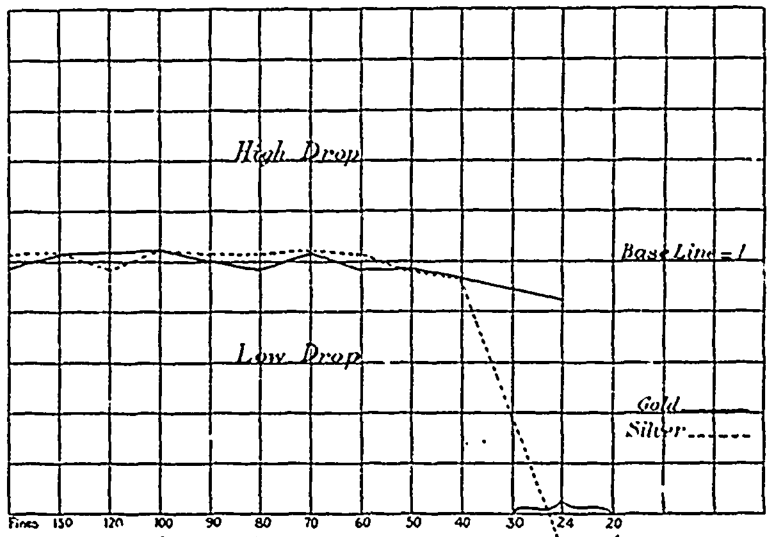


Plate II.



Curves Plotted from Ratios Showing Difference between High Drop, High Discharge Pulp and Low Drop, Low Discharge Pulp, as to actual quantities of Precious Metals remaining in different sizes of Pulp.

TABLE showing Effects Produced by changing from Low Drop and Low Discharge to Higher Drop and Higher Discharge in Stamp-Milling the same Ore.

Meshes.	Corresponding size of grains, millimeters.	Per cent. of Total Ore remaining on each Screen.		Assay Results. High Drop.		Assay Results. Low Drop.		Ratios of Actual Amounts of Precious Metals in each grade of Pulp between High & Low Drop Pulp. Excess on High Drop Side.		Excess on Low Drop Side.		
		High Drop.	Low Drop.	Gold. oz.	Silver. oz.	Gold. oz.	Silver. oz.	Gold.	Silver	Gold.	Silver.	
20	0.85	.01	88	......	....	.34	8.51	......	......			
24	0.708	.04	1.96	0.25	8.98	0.455	10.70	......	......	1/6.06	1/40.82	x ÷ 1 1/7.06 and 1/41.82
30	0.535	.26	8.16	......	....	0.43	10.44	......	......			
40	0.374	5.96	16.14	0.245	7.875	0.235	8.565	......	......	1/2.61	1/2.49	
50	0.279	6.34	8.34	0.22	8.105	0.175	8.665	......	......	1/1.04	1/1.40	
60	0.232	9.70	8.54	0.255	8.04	0.405	8.58	......	1/1.06	1/1.35		
70	0.197	2.37	1.21	0.26	8. 9	0.345	9.275	1/1.45	1/1.75			
80	0.171	3.10	1.96	0.28	8.105	0.485	10.615	......	1/1.20	1/1.09		
90	0.155	10.54	8.62	0.325	9.80	0.40	10.81	1/1	1/1.10	1/1		
100	0.139	5.58	2.90	0.30	10.29	0.355	12.195	1/1.62	1/1.62			
120	0.110	6.57	5.25	0.25	9.49	0.455	14.93	1/1.45	......	......	1/1.26	
150	0.093	9.82	5.35	0.31	11.33	0.585	15.385	1/1.02	1/1.35			
Finer than 150	......	39.55	30.19	0.35	15.95	0.50	19.135	......	1/1.09	1/1.05		
Totals..	......	99.84	99.50									

Gold Mining in Nova Scotia from 1860 to 1899.

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* By DR. A. R. C. SELWYN, C.M.G., late Director Geol. Survey of Canada.

In the Geological Survey Progress Report, 1870-71, this subject was fully treated both from practical and theoretic aspects. The former embraced mechanical and metallurgical appliances then in use; average yield of gold per ton and the great loss in the tailings; the latter the geological age, the general character and the probable depth and permanence of the veins and their origin. Also the probable occurrence in Nova Scotia, if properly sought for, of rich alluvial deposits like those of Australia, California and British Columbia.

Apart from the adoption of improvements in mechanical appliances and metallurgical processes, there does not seem to have been any marked or substantial progress made during the past quarter of a century and we find that the yield of gold from Nova Scotia ores thirty years ago, in 1867, was more than it was in 1896, viz: 27,314 ozs. in 1867 and 26,112 ozs. in 1896.

In the Geological Survey Reports of Progress above referred to, practical recommendations were made by which the production of gold in Nova Scotia might be largely augmented. Again in 1871 Professor H. Goule Hind addressed a very detailed and exhaustive report in seven chapters to the Chief Commissioner of Public Works and Mines, in which similar recommendations were made. In a paper by the same author read before the Society of Arts, London, 25th May, 1870, the subject was discussed, and even now, in 1899, the remarks then made by Mr. Sopwith and the Chairman, the late Sir Warrington Smith, are still largely applicable to gold mining in Nova Scotia. Mr. Sopwith said he had just returned from Nova Scotia and he could to the utmost corroborate the statements made by Professor Hind as to the manner in which gold mining was conducted there.

One of the most important points in any large gold producing country was the treatment of the tailings and arsenical pyrites from which the gold is more difficult to separate than from any other metals with which it is found combined. He might mention that in the Montague mine, which is one of the most interesting in the Province, and is near Waverley, there were found in the foot-wall of the lode masses of arsenical pyrites, about the size of two fists joined together, at very short intervals, and this really amounted to a very considerable portion of the lode, which was only two inches thick. It was very probable that this pyrite would give from £80 to £120 per ton. Sir Warrington Smyth said that it appeared quite certain that there was throughout this district—Nova Scotia—a sufficiently large portion of gold extending throughout these quartz ore deposits, whether bed or veins, to pay well for mining enterprise, and the question might therefore be asked: Why had it not succeeded better?

For a number of years only 600 or 800 men had been engaged in this work, but only a few mines had been successful. Was it not possible instead of these 600 or 800 men to employ 6,000 or 8,000 or even more in raising gold ores, to the advantage of all concerned?

Undoubtedly it ought to be so, for there was no doubt that in Nova Scotia there was a gold field such as was seldom to be met with, and there ought to be machinery and appliances brought to bear on it such as would ensure a very handsome return to capital invested in undertakings such as this, intended to last over a long series of years. This was really a point of almost Imperial importance, for it appeared that up to the present time the auriferous resources of the country had been developed to a pitifully small extent; and no doubt this was because the undertakings had been conducted with persons unprovided with money or with the intelligent guidance which it might be presumed they would have had if the matter had been taken in hand by persons better provided with money, without a good supply of which nothing can be successfully carried on. He could not help remembering, when mention was made of the large quantities of ore which had been stamped or crushed in order to extract the gold that it was not above two-thirds of the quantity that one single tin mine in Cornwall was in the habit of stamping per annum. This showed that the work in Nova Scotia had not been undertaken upon such a scale as to render any great success probable. Mr. Robinson remarked on the number of shafts sunk to extract quartz from a lode 1,500 feet in length. Now it must be remembered that these remarks were made in 1870, and with a few exceptions, as the mill at North Brookfield described at page 179 of the May number of the MINING REVIEW, are still very largely applicable and we may still ask why, in such a gold country as Nova Scotia are

* Proceedings Canadian Mining Institute, 1899.

there still so few people (only about 4,000, according to late statistics) employed in this industry, and why, after more than thirty years of work, is the quantity of ore treated still so small and the yield of gold no larger than in 1867? and this notwithstanding that the number of tons treated has more than doubled—31,385 tons in 1867 and 65,673 tons in 1896.

The answer is not far to seek or very mysterious. It may be summarized as follows:—

1st. Want of attention to the recommendations of such scientific and practical writers as: Marsh, 1861; Stillman, 1864; Selwyn, 1869; Hind, Sopwith, and Warrington Smyth, 1870.

2nd. The poor system of mining, always giving way to the temptation to carry out a hand-to-mouth policy, than which nothing is more effectually ruinous to successful mining. Paying all the proceeds out in wages and dividends, by which the manager soon finds himself with an empty treasury and an exhausted mine; while the stockholders, looking only for dividends, refuse to put up the money necessary to develope new "ore grounds," matters are at a dead lock and the mine is closed. This has been the frequent history of gold mining in Nova Scotia. Good reserves of capital and the unremitting exploration for new ore ground is the only remedy. The amount and richness of ore ground in Nova Scotia is such that disaster can follow only from a gross neglect of the fundamental principles of all good mining, that exploration must precede extraction and payment of dividends.

3rd. Want of reliable assayers and metallurgical chemists connected with the mine.

4th. The entire neglect of tailings and pyritous residues, which as stated by Sir Warrington Smyth, often contains a very large percentage of the total gold contents of the vein.

5th. No systematic attempts to follow up and develope the discoveries of alluvial gold. In Professor Stillman's report we find the following statement respecting this matter:—

"The alluvial detritus in the bed of Copper Lake near Tangier has been found by experiment to yield not less than $122.00 to the ton. Thirty-three thousand tons of this soil are computed to exist in the bed of this lake. The Boldue lot at Sherbrooke has yielded a considerable amount of gold from the glacial drift and is rewarding its owners handsomely. Probably too little attention has been given to this source of gold, the quartz veins alone having been the chief object of attention."

The reasons that have been given by theorists for the absence of alluvial gold deposits in Nova Scotia have prevented any intelligent and systematic efforts to find it. The long, narrow lakes in Nova Scotia certainly represent the dry "flats" and "gullies" in Australia and there is not much doubt that many of these lake beds will prove, if properly tested, rich in alluvial gold. It is utterly incredible that none of the detritus from the richly auriferous quartz veins and leads of Nova Scotia, which must have accumulated in tertiary, post tertiary and pre-glacial times, as it has in all other countries, in the existing depressions of the surface, whether these are valleys, river channels or lake basins, should not still remain in parts of these depressions as they do in British Columbia, Quebec, California and Australia. Whether these depressions are creeks, dry, grassy flats as in Australia, gulches or lake basins in no way alters the conclusion that alluvial gold in paying quantities must exist in Nova Scotia as it does in all the other countries named.

That gold can be profitably mined as at Bendigo, Australia, to a depth of 10,000 feet is now proved, and there is certainly no reason why similar depths should not be profitably exploited on the quartz veins in Nova Scotia. That such depths could and would be profitably worked in Australia was predicted by the writer in 1853, when about 600 feet was the deepest quartz mine then worked in Australia, the yield from which seldom exceeded ten pennyweights to the ton.

In connection with alluvial gold in Nova Scotia reference may be made to pages 276 and 277 of the Geological Survey Report of 1870-71, where the writer's opinion is fully stated. No actual discovery of gold in Nova Scotia was known to have been made in 1855, the date of the publication of Sir W. Dawson's "Acadian Geology."

Vancouver, B.C., March, 1899.

Notes on Specifications for Cast Iron Water and Gas Pipes.

C. A. MEISSNER, Londonderry, Nova Scotia.

(Read before April Meeting, Mining Society of Nova Scotia.)

It is my purpose to submit some data on water and gas systems which may prove of interest, not only to the members of this Society, but also to the officials and citizens putting in or contemplating to put in such systems.

This is a subject which has not yet received much general attention here, outside of the larger towns and cities, and comparatively few engineers or town officials have had any extensive experience in these matters; yet as a whole you will find the systems existant doing good service and showing that they are well put in, giving proof of the ready adaptability of the people here to entirely new and unknown conditions.

Practically this whole subject is still in its infancy in the provinces, and hence many towns hesitate to put in water or gas systems just because they are unacquainted with the details, and there are not many authorities whom they may consult or get at easily. Perhaps the good canny Scotch trait of waiting to get information for as little as possible has something to do with this, and keeps some from consulting engineering authorities. This, coupled with a perfectly correct conservatism and "make sure before you leap" frequently causes the projects for supplying water or gas systems to languish.

The difficulties are often magnified owing to lack of information, and yet there is not a town in the provinces that could not and should not have a water system. The practical and moral benefits are so apparent that I will not enlarge on the same.

One thing I have often noticed is that the average specification, which is submitted to a town, is a document of such formidable proportions and contents, that it is likely to scare many a councillor and make him defer the consideration from time to time until he has serewed his moral courage to the proper sticking point.

There is really no need for this verbosity and enlarged detail, and as a proof I submit to-day a short, concise specification which is used, among others, by the British Admiralty, and which certainly covers all points in very much less space than many others do. Of course, in large cities and for large contracts when great sums are involved, a particularly detailed specification is often necessary, but for the average small system, this one now submitted answers all practical purposes; and if adhered to will give a good reliable system.

I now want to call your attention to a few points which, in the average specification, strike me as very unnecessary and indicate a lack of practical knowledge, which at times may cost the town additional expense through the efforts of the manufacturers to comply with them.

One of these is simply not applicable at all, and is probably the result of copying without thought some engineer's specification who is not acquainted with the detail of pipe manufacture. It refers to testing with a hammer ¾lbs. and a "6 in. handle!" Now to test pipe under 30 lb. pressure with a 6 in. handle hammer simply means suicide or murder, as the tester must then walk along the length of the pipe striking his blows, and if it bursts there is very likely a funeral in prospect at the company's expense, and perhaps a sorrowing family on the conscience of the engineer who insisted on the clause.

You will note that the specification submitted to you does not specify this point. The usual system is to have a 10 ft. handle on the hammer, and tap the pipe under pressure from behind the tester's screen at the end of the pipe, or by a hammer suspended and having a certain fall as well as a lateral movement, so as to strike all along the entire length of the pipe.

Another point which is equally uncalled for is the weight limit. You will note that the specification submitted calls for a variation of

5 per cent., which is a fair, honest limit, yet we constantly meet with those which allow only 2 per cent. or sometimes 2 to 2½ per cent. variation up or down. This is, perhaps, practicable in a large works having a wide scope of customers of all different descriptions, but for the work that is demanded in these provinces, it is unjust, unfair, and unwise, as it forces the manufacturer to charge a higher price or to lose a large percentage of the pipe made for this particular town. Every engineer who has any practical knowledge of manufacturing castings or pipe, knows how difficult it is to cast such work within such narrow limits, and where is the use of it? What difference does it make to the town to give the pipemaker a little more leeway, when the average is sure to be the same, as there will always be as many pipe above as below the average figure? And surely a few lbs. weight more or less with the average water pressure of these small systems, is not going to make the slightest practical difference in strength, particularly on a fairly heavy pipe. If a town goes in too closely for economy and orders too light a pipe, then it does not want the variation below what is probably the safety limit, but then it should allow a little more leeway upwards. This thing always reacts on the town as it will ultimately have to pay a higher price for such unnecessary restrictions.

Another point that I would warn against is putting in too small a pipe for economy's sake. This is a very natural error and one frequently indulged in by small towns, and yet it is one that has invariably caused trouble and ultimately much greater expense to the citizens than would have been the case had a larger pipe been put in at first. A town should always look ahead. It is not only the present or certain individuals that have to be taken into account, but the general good, and I think there is a tendency to exaggerate individuality and to forget that it should always subserve to public good, for if not, then that which is praised as strong individuality and insistence on personal rights, may become a nuisance and a serious detriment to the public good.

This question of too small pipe at the start is beginning to be fully appreciated, and when carefully considered will no doubt be avoided by future systems.

The question of testing pipe is also one that frequently is misunderstood by towns and engineers, and hence looked upon with suspicion. Pipe manufacturers, as a rule, try to honestly give their patrons good and reliable pipe; it is to their interest to do so. For their own protection, therefore, they adopt a certain system, arrange all their labor and appliances accordingly, and in any well managed plant this system is followed out until it becomes mere matter of routine. So it is with testing pipe. There is a certain number of men employed to clean, tar, test and weigh the pipe. They have a certain routine to go through, and there is no reason for them to shirk any part of the work, in fact they must follow the various steps rigidly or they at once confuse the work of their department. All the work is recorded and regulated so that it soon becomes an almost automatic action to put the pipe into the hydraulic press, apply proper pressure, tap the pipe with the hammer and take it out. Each man has his station, and their fellow-laborers would see to it that each one did his particular share of the work, aside from the head tester's, and superintendent's, constant supervision. Besides, the men picked out for testing are usually employed for their special reliability.

And yet when a pipe breaks or shows defect, the statement is frequently made that it was not tested. To the uninitiated this may seem a correct conclusion, yet this very question of pipes that have stood the pressure and hammer tests, breaking or showing defects at a later period, is one that has attracted the attention of the best Water Engineers on this continent, and been discussed in the meetings of their societies without arriving at any definite conclusion as to its remedy. The tenacity of cast iron is very great and I consider the reason of subsequent breaking due to the handling the pipe receives in yard, on cars, and in trenches, which developes by fracture or concussion the weak spots that were able to resist the pressure and hammer test. The percentage of such breaks, however, is so small that if the citizens will look on it in honesty and fairness they will find no real cause for anxiety or complaint, for all pipe develop such weakness and have to be replaced. It is like anything else—we cannot yet reach perfection in all work which we undertake.

In one respect the Admiralty specification differs from those used on this continent, and that is that it calls for 9 ft. lengths, while pipe made here are in twelve feet lengths. The greater length saves a great deal of labor and extra lead in reducing the number of joints by one-fourth, and yet the pipe are as easy to handle and to lay in trench. I am not aware of the reason for this among Scotch and English makers.

There is one more feature that I would warn town officials against, and that is not to undertake a system without the services of an engineer, and, preferentially, of an engineer who held some previous experience in waterworks construction, though the whole training will enable a capable engineer to master the details and difficulties of a smaller system. This is particularly the case where special classes of pipe are put in, such as flexible joint for crossing a river, etc. I have seen some very unfortunate and costly experiments made with this pipe because the towns begrudged the few dollars to an engineer. Yet the few dollars would have saved the towns many hundreds. Such work must be studied out; it must be done right or it will invariably fail, and likely as not the blame laid on the pipe, when it is the method of "rule of thumb" and "penny wise and pound foolish" that is entirely to blame.

I trust some of these points will prove of interest and value, and that a little thought and money expended in investigating these matters will avoid many annoyances and costly delays in future systems.

SPECIFICATION FOR CAST IRON PIPES.

(1) The pipes are to be cast to the lengths, diameters and thicknesses quoted in the schedule.

(2) The whole of the pipes, bends and other castings are to be of the best metal, remelted in the cupola, of fine grain, homogeneous, of even grey color, to be cast in dry sand moulds, and with a sufficient head of metal to ensure solidity. This head or dead end is in all cases to be cut off in the lathe.

(3) The larger pipes of 4 in. diameter and upwards are to be cast vertically, socket downwards. Pipes of small diameter may be cast on inclined beds. The pipes are to be truly cylindrical in bore, straight in axes, and to have the inner and outer surfaces as nearly as possible concentric. The internal diameter to be such that a wooden disc of ⅛ of an inch less in diameter than that specified shall pass freely through the length of the pipe.

(4) All pipes and other castings of uneven thickness, or in which any imperfections shall appear, or any sand holes, air holes, scabs or spongy places occur, or in which any defect may be found plugged or filled up, will be rejected.

(5) Test bars shall be cast from time to time as may be directed. They shall be run while the pipes are being cast, and from the same metal. These bars shall be 3 or 4 ft. long, 2 in. deep and 1 in. broad, and when placed on supports 3 ft. apart shall bear without fracture a central load of 30 cwt. applied gradually, and show a deflection of ⅜ of an inch.

(6) The whole of the pipes are to be subjected to a proof by hydraulic pressure of 400 ft. head.

Each pipe while under pressure shall be struck hard from end to end with a hammer of from 4 lbs. to 7 lbs. weight, according to the size and thickness of the pipe, and such pipes as may be considered defective in the opinion of the Inspecting Officer shall be inspected and at once marked to prevent their acceptance if delivered.

(7) Should an Inspecting Officer not be present while the pipes are being proved, a proof note, showing that the pipes have been tested by the contractor in accordance with this specification shall be sent for the information of the Superintending Officer, and such pipes as may then be found defective will be rejected, and must, after due notice, be forthwith removed from premises by and at the cost of the contractor.

(8) The pipes after proof are to be thoroughly cleaned inside and out, and are then to be coated by Dr. Angus Smith's patent process.

Each pipe is to be heated uniformly in a proper oven to a temperature of 700 degrees Fahrenheit and dipped vertically into the mixture of coal tar pitch, resin and linseed oil (5 to 6 per cent.) which must be kept at a temperature of 300 degrees Fahrenheit, and not allowed to thicken unduly. When each pipe attains the temperature of the above mixture it may be withdrawn gradually, and allowed to cool in a vertical position.

No pipe will be accepted unless perfect cohesion has been effected between the metal and the coating, both inside and out.

(9) Such marks or numbers as may be directed shall be cast on each pipe or other casting for the purpose of identification; and, after the pipes are coated, such paint marks as may be arranged shall be placed on each casting, to facilitate transport, sorting and laying.

(10) The weights of the other pipes and castings will be estimated according to the dimensions quoted in the schedule herewith.

A deviation from the weights to the extent of 5 per cent. will be permitted; that is to say, any pipe more than 2 per cent. below the specified weight will be rejected, and where the tender is by weight any excess beyond 3 per cent. on each separate casting will be paid for.

(11) All testing and proving on the contractor's premises shall be carried out at his cost, and to the satisfaction of an Inspecting Officer who shall be afforded every facility in the discharge of his duties, and shall be provided by the contractor with such gauges and apparatus as may be necessary for the proper testing and inspection of the work.

Officer in Charge of Works.

MINING SOCIETY OF NOVA SCOTIA

HOLDS A SUCCESSFUL ANNUAL MEETING.

The adjourned Annual General Meeting of the Mining Society of Nova Scotia was held in the rooms of the Society, Halifax Hotel, Halifax, on Wednesday, 12th April. There was a representative attendance of the prominent mining industries of the Province including:—

H. S. Poole, M.A., A.R.S.M., General Manager, Acadia Coal Co., Westville.
Charles Fergie, M.E., Managing Director, Intercolonial Coal Co., Stellarton, N.S.
R. H. Brown, M.E., General Manager, General Mining Association, Old Sydney Mines, C.B.
C. A. Meissner, Gen. Manager, Londonderry Iron Co., Londonderry, N.S.
M. R. Morrow, Dominion Coal Co., Halifax.
James Baird, Joggins Mines, Maccan, N.S.
George W. Stuart, Truro, N.S.
F. H. Mason, F.C.S., Halifax.
C. F. Andrews, Economy Gold Mining Co., Isaac's Harbor.
W. L. Libbey, Brookfield Mining Co., N. Brookfield.
Charles Archibald, Halifax.
A. B. Cox, Richardson Gold Mining Co., Country Harbor.
George A. Pyke, Richardson Gold Mining Co., Halifax.
Clarence Dimock, Wenworth Gypsum Co., Windsor, N.S.
C. E. Willis, M.E., Halifax.
A. A. Hayward, M.E., Waverley, N.S.
B. C. Wilson, Waverley.
T. R. Gue, Halifax.
John A. Anderson, Musquodoboit Harbor, N.S.
Joseph Austen, Halifax.
H. V. Haight, Halifax.
J. E. Hampson, Halifax.
Geoffrey Morrow, Halifax.
H. W. McKenzie, Intercolonial Coal Co., Halifax.
W. G. Matheson, New Glasgow.
D. W. Robb, Amherst.
Alex. McNeill, Halifax.
H. A. Sanders, Halifax.
C. C. Starr, Halifax.
H. W. Weller, Halifax.
H. M. Wylde, Halifax.
B. T. A. Bell, Ottawa.

Mr. Charles Fergie, *President*, took the chair at 10.30 a.m. The minutes having been read and confirmed the financial statement was submitted and unanimously adopted.

PRESIDENT'S ADDRESS.

Mr. FERGIE—In accordance with established practice it is now my privilege as retiring President of this Society to deliver you an address.

I am pleased to report that the membership of the Society continues to increase, and, what is of equal importance, the Society is out of debt and on a good financial footing.

The several meetings during the past year I think you will agree have been a success, and that many interesting and valuable papers have been contributed.

Whilst speaking of papers I wish to impress upon the members generally the great importance of writing for the Society. The importance of a Society like ours can only be gauged by the number and value of the papers contributed, and the writing of such papers should not be left to the few, but each individual member should make it a point to contribute something at least once a year, be it ever so little. Often when urging members to write I have been met with the reply: "Oh! I have so little to write about, I cannot give a long paper." Now, what I wish to say to these members is: We do not ask or want long papers; what we want is that members will give us the benefit of some particular experience gained in their particular line of business. It does not matter if it be only a single paragraph, let us have it; it is more than likely to lead to discussion, which is what we want, and in my opinion the discussion is often the best part of the paper.

The chief branches of activity in this Province are coal mining, gold mining and iron smelting, and it is highly gratifying at this time to record that all these branches are in a fairly satisfactory condition, and the immediate future prospects are assuring.

The returns given by the Mines and Works Department for the year ended September 30th, 1898, show the production to be: Coal, 2,281,454 tons; gold, 31,104 ounces; and iron ore, 31,050 gross tons

The prosperity of the coal trade is largely guided by that of the iron trade, and it is satisfactory to know that the erection of extensive iron works in Cape Breton is soon to be an accomplished fact. This will not only benefit the coal trade generally but its benefits will be widespread throughout the Province.

That gold mining in Nova Scotia is no longer looked upon as a speculation, but as a reliable investment, is now patent to all, and the splendid returns being regularly made by mines working on low-grade ores is evidence of this, and is bound to attract—as it already has—attention from abroad, and secure for Nova Scotia the one thing needful to make it the best and safest investing field for gold in Canada—that is capital.

Mining to be a success must be conducted upon the most modern and economical lines, and it is by meeting here together that we can discuss and compare notes and gain experience and valuable information the one from the other.

A manager must be ever on the alert, and keep a keen lookout for leakages. He must constantly make comparisons of cost and production, satisfy himself that nothing is being wasted, that every employee is in labor giving his full value in wages paid, and that not one unnecessary hand is employed. He must be discreet in the selection of his assistants and overmen, and endeavor to gather around him only the most practical, sober and experienced workmen. He should impress, by his actions, upon his workmen that his word is as good as his bond, and no matter what be the consequences should never break faith in any contract made. In this way he will gain the confidence of his workmen and the better be able to enforce that strict discipline, without which no mine can be a success.

In these days of keen competition and small margins a mine manager should have a good general knowledge of mechanical engineering; he should know just what class of machinery is most suited to his particular requirements, and be able to at once say and decide as to whether steam, compressed air or electricity is the most suitable and economical power to be installed.

The question of motive power is an important one, and where power is required to be distributed over certain districts I feel sure it will pay mining men to turn their attention to electricity as in many cases I am satisfied it would prove far more economical than either steam or compressed air.

From the returns just issued by the Department of Mines we find that the Province realized from its mineral resources the sum of $277,870.74, made up as follows:—Prospecting licenses, $16,459.50; alluvial licenses, $350.00; rents (gold lease applications), $4,249.50; gold rentals, $4,726.00; gold royalty, $11,544.93; licenses to search for minerals other than gold and silver, $4,680.00; leases for minerals other than gold and silver, $7,530.00; coal royalty, $227,011.31; fees, $319.50.

Of this amount it will be seen that coal royalties contributed no less than 81¼ per cent. of the total, and the prospects are that 1899 will show a still larger increase.

There are many other matters I might have brought before your notice, but I will not trespass further on your patience. I trust that during the year now entered upon our meetings will be well attended, and prove still more successful than even those of the past, and that the transactions will bear witness that every member has determined to take his share of the work, and promote the interests of the Society in every possible way.

Mr. B. T. A. BELL—If I am in order in discussing the very practical remarks of the President, I should suggest the desirability of the Mines Report showing the values of the minerals in the Province. The brief summary usually given in the opening page of the Report gives to outsiders a wholly inadequate idea of the position and importance of the mineral production of Nova Scotia. Take the item "iron ore 31,050 tons"—readers of the Blue Book, he thought, should be informed that the whole of that quantity of iron or at all events the bulk of it was manufactured in the Province into pig iron, steel billets and steel manufactures representing a considerable value over the mere mining of the ore. Then no returns were given of building materials produced as was done by other Provincial Governments. Roughly speaking the value of the mineral production of Nova Scotia at the pit's mouth would be about $6,000,000. The labor, wage earnings, capital invested and other statistics, ought also to be tabulated to show the relative importance the mining industries have to the other industries of the Province and mining in other portions of the Dominion.

On motion of Mr. Stuart seconded by Mr. Poole, a vote of thanks was passed to the President for his eminently practical address.

Mr. MCNEILL—Do I understand that the Government gives returns of quantities but not of values!

Mr. B. T. A. BELL—No values are given. I would move that the Council be authorized to ask the Government to incorporate a table showing the values of all minerals produced in the Province, whether charged for royalty or not.

Mr. DIMOCK seconded the motion.

Mr. POOLE—I do not know whether this discussion might not be very well postponed until later in the day when I understand one of our members had something to submit respecting the Mines Report. I think the table Mr. Bell refers to has not been extended for the past 25 years.

At the suggestion of the President further discussion was postponed.

NEW MEMBERS.

Messrs. McKenzie, Bigelow, Percy H. Smith and McNulty were elected members.

DATE OF ANNUAL MEETING.

On the suggestion of the Secretary the Constitution was amended in order to permit the Annual Meeting being held on the second Wednesday in April instead of the second Wednesday in March.

ELECTION OF OFFICERS.

The following were then elected officers for the ensuing year :—

PAST PRESIDENTS :

H. S. Poole, M.A., A.R.S.M.
J. E. Hardman, S.B., M.E.
R. H. Brown, M.E.
R. G. Leckie, M.E.

PRESIDENT :

Mr. Charles Fergie, M.E., Intercolonial Coal Co., Westville, N.S.

VICE-PRESIDENTS :

J. G. Rutherford, M.A., M.E., Stellarton.
W. L. Libbey, N. Brookfield.
George W. Stuart, Truro.

SECRETARY-TREASURER :

H. W. Wylde, Halifax.

HON. SECRETARY :

B. T. A. Bell, Ottawa.

COUNCIL :

C. H. Dimock, Windsor.
F. H. Mason, F.C.S., Halifax.
H. D. McKenzie, Halifax.
M. R. Morrow, Halifax.
James Baird, Maccan.
C. F. Andrews, Isaac's Harbor.
C. A. Meissner, Londonderry.
C. E. Willis, Halifax.
Alex. McNeill, Halifax.

THE LIBRARY.

Mr. A. McNeill called attention to the desirability of increasing their library. He thought that if proper representations were made the library of the Institute of Science might be amalgamated and a suitable building for both provided in the new government building.

Mr. Bell stated that he had suggested an appropriation at the meeting of the Council, and it had been decided to spend some money in much needed improvements.

Mr. McNeill—I know the Institute of Science is looking for a suitable habitation for their library. Is it the intention of the Society to apply for a room in the new Government building?

Mr. Poole—I was always in hope that when the Government had the new building that we could get the library Mr. McNeill refers to.

The President—It was suggested at one of our previous meetings that we hand over our library if the Government would appoint a librarian.

Mr. Bell—I think we should not overlook the point that our library to be effective must be practical. All that we aim at is to get together such reference books as may be useful to our mining men when they come into Halifax. If these publications are to be moved it is doubtful whether this object will be as well accomplished. If the books and periodicals we have were properly provided with suitable cases and kept under lock and key there could be no objection to the present rooms being maintained.

Mr. H. M Wylde—I would like to point out that this time last year we had a room outside of the hotel, and it was the unanimous opinion that accommodation in this hotel, where most of the mining men put up, would be more suitable. The proprietors are now fitting up another room for us.

The President—It is not certain the Government will provide us with a room.

After some further discussion the following were appointed to see the Premier on the matter : Messrs. Stuart, Hayward, Austen and McNeill.

SOME INCIDENTS CONNECTED WITH THE DISCOVERY OF THE ROSE LEAD, MONTAGUE.

Mr. Geo. W. Stuart presented a paper on this subject (reproduced elsewhere in this issue).

The President said that all the members would agree with him in thanking Mr. Stuart for his excellent paper. He thought that if every member would furnish the Society with a paper somewhat similar to the one which had just been read, it would have a great many interesting papers.

Mr. H. S. Poole—I have much pleasure in saying that this paper has given me a great deal of pleasure. The striae in North America has always had an attraction for me. He said he remembered a paper by Dr. Honeyman some years ago in the Institute of Science—he had spoken of a drift at Cow Bay, and he had given the direction of the striae on rocks which came from the Cobequid Hills and some of the Trap around the Bay of Fundy, agreeing with the striae Mr. Stuart had found in Montague. It would be about in the same direction, which showed that there was evidently a flow from the north. I would like to call the attention of the Society to these striae—that they are not parallel all over the Province. There are two or three courses in some parts, and then if I mistake not the general course is from the higher ground than with reference to the magnetic meridians. In our own county it is north 42 east—and there the drift is shown to have crossed from the higher ground towards the Northumberland Straits. This matter of the striae comes up in the paper of Mr. Faribault. He speaks of the denudation but he does not speak of the gold placer deposits in our gold fields along the coast. But, taking the coast, I think you find it in the course Mr. Stuart spoke of. I think the paper which has just been read an exceedingly valuable one, and I am glad that Mr. Stuart has put it in such an attractive form.

Mr. Geo. Stuart—The striation marks are one of the first things I look for in order to prospect intelligently. I find that where there is a hill or mountain, or receding ground, that on the eastern and western sides there will be a slight deviation in the striation marks, if it is of any importance and covering territory of some miles. I find it influences the course somewhat if it is slightly to the east, and if west slightly to the west. (Mr. Stuart illustrated his remarks with the aid of articles lying on the table.) I may say in no instances where I have found the drift that it has not been subjected to water wear, if it has fairly angular corners. In every case where I have been able to find striation marks I have invariably round the lead exactly in range with the striation marks. There is no difficulty in the world if you find the drift that has not been subjected to water wear you can find the lead. It apparently is true of distances from a few feet from the road to miles. Take, for instance, the Dufferin drift. A great deal of the Dufferin drift was found down near the shore, 2½ miles. It had crossed diagonally rough country. It had crossed the Salmon River, and has been found 100 feet above the level of the river. It came straight as a line could be drawn from where it was detached from the lead.

MINES DEPARTMENT REPORT.

Mr. W. L. Libbey presented his criticism of the last Report of the Mines Department (reproduced in this issue.)

Mr. H. S. Poole—I had occasion to look at page 73 of the Report and in looking over the statement of Coal Sales 1785 to 1898 my eye caught an error in one entry. A closer inspection showed no fewer than eleven errors carried forward from year to year and we would have to go back ten years to find the correct figures for these items.

Mr- R. H. Brown—I have noticed the points that Mr. Poole has spoken about from time to time. There is a great deal that could be corrected in this Blue Book and there is a great deal of matter which could be published in it with advantage. A glance at the Reports of the Inspector of Mines for Pennsylvania and Iowa will at once show how meagre our Report is in comparison.

The President—It is very evident there is not the care and attention paid to the Reports that there should be. Much serviceable matter could be introduced and a great deal of the rubbish eliminated. The public does not want to know whether I am driving No. 6 balance or whether I am in good ground or bad ground—whether I am 2,000 feet in the head or 200 feet coming home.

Mr. Baird cited an instance where the Report had mentioned a discovery of certain coal seams but on examination the seams did not show as many inches of coal as were given in feet in the Report.

The President—There has never been appointed an experieuced gold miner to examine and inspect the gold mines.

Mr. Poole—Not that I am aware of.

The President—The gold mines have been examined by the Deputy Inspectors of the collieries.

Mr. C. E. Willis—During my seventeen years experience there never has been any competent inspector of our gold mines.

Mr. McNeill thought action upon the discussion might be left in the hands of the Council.

The Session then adjourned.

AFTERNOON SESSION.

The President took the chair at three o'clock.

Mr. Mason read a paper by Mr. A. C. Ross, "On the Discovery of the Rare Mineral Wolfram at Margaree, Cape Breton" (reproduced elsewhere), The paper was discussed by Messrs. Meissner, Willis and Mason.

THE GOLD MEASURES OF NOVA SCOTIA.

Mr. Faribault's paper, read before the Canadian Mining Institute, was then taken up, but as Mr. Faribault had consented in person to be present at the next meeting of the Society, the discussion was not extended.

Mr. H. S. Poole—My first disposition on reading this paper was to congratulate Mr. Faribault on its many excellent features, but on second thought I concluded that congratulations were rather due to this Society on having so valuable a paper to publish in our transactions. Of course it would never do for a captious person like myself to say it could not be improved and has no shortcomings, but were I to mention what may seem to be one, I would only by accentuating so small a failing enhance the high appreciation I would put on the paper as a whole. It is what has been long wanted, a text book for prospectors in our gold-fields. The language is clear and terse, the facts announced are not buried in verbosity and involved sentences. The matter could not easily be better arranged, and with the aid of the map and sections Mr. Faribault's explanations are easily followed and understood.

Many of us in the past have had something to say on this subject, to record a few facts and express an opinion or two; but Mr. Faribault comes on the field, devotes years to the study of its structure, weighs the records of reputed facts and the various theories that have been advanced, surveys the surface, compiles his data, eliminates and condenses and then produces a report of a character too practical to be left buried in an official blue blook. A free copy or a cheap copy is wanted for every operator and prospector in the Province.

No better illustration could be found of the value of systematic work in our geology. Private individuals may do much in their immediate neighborhood, but their opportunities are so limited, their field of observation so restricted that they cannot compete with an official who devotes no less than 17 years to this one subject and sweeps the Province from end to end for data. Here is an official to whom no information is valueless, who utilizes every rock exposure, and in whose hands the very failures of miners have their use and purpose.

Mr. Faribault notes the absence of data necessary to explain many peculiarities in the different gold districts as few plans or records have been kept. It is true the value of plans was foreseen years ago, and I published one of the Lawson mine, Montague, prepared by the owners over 20 years ago. It was given as a sample that others might follow, but certain officials would have none of the trouble that looking after plans would entail and induced the legislature to repeal the law of 1885 which called for the collection of data respecting depth and extent of workings in the gold districts. What may this be called? Pandering to laziness? Whatsoever it was, the fact is the law was on the Statute book ; it was repealed, and the want of the very information it called for has been often since regretted by both legislators and gold miners.

Not the least interesting of the matters touched on in this paper are those purely of geological consequence. The deposition of the Cambrian strata in the ocean off a Pre-Cambrian shore very much in line with the general course of the coast of North America to-day—the thickness of these strata not less, Mr. Faribault says, than 5 miles—strata that ultimately weighed down the plastic crust of this earth and thus gave rise to a lateral pressure that caused them to take on a series of folds parallel to the line of coast ; and yet apparently they were not of a thickness sufficient to cause the lateral pressure to produce a cleavage across the planes of bedding. Then the question may be asked : What has determined the distance between the crests of the folds, and why should there be more folds in a given distance at Bendigo than in Nova Scotia?

Again, Mr. Faribault speaks of denudation having removed 8 miles of material; what lapse of time does such a planing down represent? We know that very little protection from soil has preserved to us the striae made on the rounded surface of these rocks some 10,000 years ago by the glacial drift.

Then there are speculations of more material moment suggested by the grouping of the pay streaks in the leads. What has determined the deposition of the metallic gold in these pay streaks? Has there been anything in the nature of galvanic action or chemical reaction set up in the solutions of quartz and gold that circulated along these fissures as they gradually opened before the overpowering plicating pressure?

Whatever the method, it seems according to Mr. Faribault to have been subject to some established law, and certainly to have been more honest and systematic, if not quite so rapid in action, as the late process of the Revd. Jennings on the adjoining coast of Maine. All of these enquiries I would respectfully submit to the officers of the geological survey.

Mr. DIMOCK—Mr. Faribault's paper is of great value.

Mr. A. B. COX had not studied the paper sufficiently yet to say anything that would be of interest to the members. He could not say whether Mr. Faribault's theories were correct or not. There was some talk of his company (the Richardson) putting down a trial shaft in the underlying rock.

Mr. BELL—On the dome of the anticline?

Mr. COX—Yes.

Mr. C. E. WILLIS—There is a property about a mile west—directly west of the Richardson mine in which the same occurrence has been found

Mr. A. B. COX—All to the turn.

Mr. C. E. WILLIS—There are some four veins to be found on the south dip and north dip converging towards each other, which must turn 500 ft. or 600 ft. from where they are working. It proves Mr. Faribault's contention, that all the veins in that district which are on the anticlinal turn. On this mountain property these four veins are within 125 ft. of each other north and south. They have been cut 150 ft. east of where the shaft is, and they seem to be much narrower on the same general strike, which proves they must turn and come around to where they have been opened. These veins would probably be a mile deeper than the vein Mr. Cox is already working. They would be a mile in depth, taking the geological strata.

Mr. A. B. COX—We find the dip of the anti-clinal or fold is on an angle of 45 degrees.

Mr. C. E. WILLIS—That is, to strike this vein on the Richardson property you would have to sink a shaft one mile in depth.

Mr. A. B. COX—Yes.

Mr. C. A. MEISSNER—I think both Mr. Poole and Mr. Cox have brought out some points which are of interest with respect to other minerals perhaps outside of coal. Mr. Poole's point about the lack of information in the shape of maps, etc., I think is very well taken. Of course in many cases it may not be practicable or desirable to have the maps made public. But even for private use there seems to be very little laid out on paper to show what has been done. I think that Mr. Fergie will bear me out in that in some of the ore deposits. For instance, in irons and tungstens and other metals where we have to deal with broken and irregular formations, many of us have not time to study the geological formation, and I think we are very fortunate in having the Geological Survey bring their work so clearly before us. In our branch there is very little practical or economical work done yet. And I presume that the only practical solution would be for the Geological Survey to put three or four men in the field to determine these formations.

Mr. B. T. A. BELL—Would it be advisable to introduce a Government diamond drill for exploration of these iron deposits in this Province?

Mr. C. A. MEISSNER—I think it could be done to good advantage, but we would have to have a good drill man. I had recently an experience which cost us a lot of money.

Mr. B. T. A. BELL—The principle of the Government drill is a good one provided a proper record is kept of the borings in the Mines Office.

Mr. C. A. MEISSNER believed it would achieve good results.

Mr. B. T. A. BELL—The Ontario Government provides a drill free of charge and the party who obtains the use of it pays operating expenses.

Mr. C. A. MEISSNER—The competency of the man who runs the drill is an important feature. By the improper setting of diamonds they had lost $80 on a few feet. The core was ¼ inch.

Mr. H. V. HAIGHT—The Australian Government has been doing considerable work with the calyx drill—using steel instead of diamonds. In one instance they ran 100 feet in ten hours. It was a 1 inch core drill. Steel will not take granite or harder rock.

The PRESIDENT—That was in sandstone.

Mr. H. V. HAIGHT—Yes.

The PRESIDENT—This diamond drill business has been before the public on many occasions but it does not seem to have any effect.

Mr. B. T. A. BELL—Mr. Meissner, would you be in favor of this Society placing itself on record with respect to the Government making provision for the purchase of a diamond drill and having it under the Mines Department for a series of explorations. The Dominion Government cannot hope to do more than they are doing now. Mr. Fletcher and Mr. Faribault have rendered invaluable service to the Province.

Mr. MEISSNER—I would be very glad to make a formal motion if the members thought it wise to do so.

The PRESIDENT—As this discussion on Mr. Faribault's paper is about finished, I was going to say that Mr. Faribault kindly promised to attend our fall meeting, and I propose that we adjourn this discussion on his paper until he is present himself.

Mr. GEO. W. STUART—I think we ought to take some action in regard to persuading the Dominion Government to retain the services of Mr. Faribault.

Mr. B. T. A. BELL—The Canadian Mining Institute passed a resolution calling the attention of the Government to the inadequate maintenance of the staff of the Geological Survey.

Mr. GEO. M. STUART—I am in possession of information direct that unless Mr. Faribault's salary is increased to the very moderate sum of $1,800 a year he will certainly leave the department. He has offers from individual companies to go into their employ at a considerable increase of $1,800 a year. He is now receiving $1,400, and the department has intimated their intention of giving $100 more making it $1,500 a year. During our interview just now with Premier Murray I suggested that if there was anything the Nova Scotia Government could do to assist in having the Dominion Government resume the services of Mr. Faribault we thought it would be wise for them to do it. The Premier said that he was favorably impressed with the work that Mr. Faribault had done for the Province and that his Government would employ him rather than have his services lost to the country.

Mr. ALEX. MCNEIL—I understood the Premier to be very much interested in retaining Mr. Faribault's services for Nova Scotia, but I did not understand from him that he had in view the appointment of him to a particular position at present.

After some further discussion it was moved by Mr. Poole, seconded by Mr. Stuart:—

Resolved, That the members of the Mining Society of Nova Scotia here with place on record their appreciation of the services of the Geological Survey of Canada rendered to the mining interests of Nova Scotia, and particularly of the thorough and trustworthy work done by Mr. Fletcher and Mr Faribault; and they would also urge upon the Dominion Government the imperative necessity of increased financial assistance for their department with a view to the increase of the work in this Province.

REPORT OF COMMITTEE.

Mr. ALEX. MCNEILL presented a report of the interview the Committee had had with the Premier respecting obtaining quarters for the Society in the new Government building. The report was favorable.

OTHER PAPERS.

Papers were then read by Mr. Mason on "The Cheticamp Silver Deposits," by Mr. Hayward on "A New Ore Skip," and by Mr. Meissner on "Specifications for Gas and Iron Pipes."

The session adjourned at 6 o'clock.

Mica Mining in Canada.

In his Annual Report, issued this month, Mr. J. Obalski, Inspector of Mines Quebec, has something of interest to say respecting the progress being made in our mica mining industry. He writes:—

There has been considerable development in the mica industry, in proof of which it suffices to remark that in 1897, from 50 to 100 men only were employed in it, while in 1898, the number of persons employed in the mines and in trimming the mica exceeded 250, with seven or eight important mines in operation and some 20 prospects producing a little mica. In the course of the year, a large number of prospecting licenses in the counties of Ottawa and Pontiac were taken out. In the latter, some discoveries were made, so far of little value but which may lead to more important finds.

The demand for amber mica, which is almost exclusively shipped to the United States, is good and we must believe that the Canadian mica is well appreciated, seeing that it finds a regular market notwithstanding the high duty of 20 per cent. *ad valorem* and 6 cents per lb. on thumb-trimmed mica and 12 cents on the knife-trimmed article and it may even be remarked that the consumers, while being very hard to please as regards the fashion in which the mica is prepared, are less so with respect to the quality itself; certain dark colored micas, which were formerly difficult of sale, now finding purchasers much more easily. The demand also appears to be better for small mica and less for the large, which results in the first place from the great difference in the price, which may range from 5 cents for one by three inches to $1 per lb. for mica of large dimensions. These large dimensions were formerly necessary, but they are now replaced by plates of *micanite* (prepared by E. Munsell & Co., of New York) or of *micabeston* (prepared by W. H. Sills, of Chicago) which are nothing but thin sheets small mica glued one upon the other and afterwards pressed to the thickness of $\frac{1}{16}$ of an inch, thus forming plates which are cut any desired size. The United States customs duties are paid by the consumers and weigh more heavily on the small than on the large mica. Thus, mica of 5 cents per lb. or $100 per ton has to pay 20 p.c. or $20, besides 6 cents multiplied by 2000 or $120 thus $20+$120=$140 or 140 p.c. while mica of $1 per lb. or $2000 per ton has to pay 20 p.c. of $2000 plus 6 cents multiplied by 2000, namely $400+$120=$520 or 26 p.c., freights being the same. The tariff of 12 cents on knife-trimmed mica also explains why thumb-trimmed mica especially is shipped upon which there is only a duty of 6 cents, besides the 20 per cent *ad valorem*. The mica is sold in barrels weighing 350 lbs. nett."

Our illustrations show some of the principal producing mines in Quebec and three unique "snaps" of the work being done by Mr. Smith, of Kamloops, on his Tete Juan Cache property, Canoe River district, British Columbia.

The Blackburn mine was for many years worked at a profit for phosphate, but on the collapse of this industry the owners directed their attention to the production of mica, and at present about 50 persons are regularly employed at the mine. Our engravings are from photos kindly sent us by Mr. Hugh C. Baker, B.A.Sc., for a number of years manager of the mine. Mr. Baker has since gone to British Columbia.

MINING NOTES.

Richardson Gold Mining Co—The last month's crushing at this successful Nova Scotia mine gave a brick of 386 ounces A recent letter from Manager Cox says: "In the mining operations we have made a considerable improvement in the handling and working of the ore and also in the working of the plant. In the first place we have done away with the washing of the ore at the deck, because on examining the waste rock we found it to carry more or less gold, and we allowed the whole belt to be hoisted on deck where it is passed through the ore breaker without any culling and thence it is trollied into the crusher bins and from there it passes through the automatic feeder into the batteries where the whole mass is crushed and the result gives us fully as good a yield per ton as when it was washed and culled. We have also put a pump in the north shaft (so called) so as to work east from there as well as from the south shaft, which gives us two stopes working east at the same time towards the axis of the semi-cone, and at the same time stopes are carried west of the north shaft. In the winter of '96-'97, finding hand drills too slow on account of the rock becoming more solid and hard, we put in three steam drills of Sergeant Auxiliary pattern which we supply with steam from the boiler that supplies the compound engine that drives the pumps, the hoist and the ore breaker, and these three drills have kept our forty stamps supplied with ore ever since at the rate of 2,100 tons per month on an average. Then, in the autumn of '97, to get a more direct haul from the large body of ore which is formed around the turn of the belt, we sunk another shaft on the axis of the anticline, out of which we run a self-dumping skip of ½ ton capacity, which dumps its load at the same deck head as the skips from the other two shafts. And later, finding it convenient, we have placed a pump also in this shaft and have made this shaft the deep part of the mine. This part of the mine is now down to the depth of about 350 ft. from the surface, the north shaft 260 ft and the south shaft 250 ft. In order to get an intelligent description of the formation and workings of this mine as they appeared in August of last year, I would refer you to a survey made by Professor Porter and Messrs. Campbell and Morgan, of McGill, a copy of which, I understand, is now in the hands of Dr. Dawson at Ottawa. We have also given our compound engine more power by attaching to it a jet condenser and circulating pumps of the Blake pattern, also another large one of the same pattern to the Corliss engine at the crusher which throws upwards of 300 gallons of water per minute up into our tank from which we supply our batteries and boilers, and we use the residue to wash our pulp away down the sluices. We have also placed one of the Wilfley concentrators in the mill which has been saving the concentrates out of the pulp from twenty stamps since last August; these concentrates are being saved for future treatment. We anticipate in the near future to add another of the same pattern alongside of it to take care of the pulp that flows from the other 20 stamps."

LAKE OF THE WOODS.

The Triggs Mine.—During the sleighing season about 200 tons of quartz was hauled out to the shore of Witch Bay, Lake of the Woods, ready for shipment to the reduction works upon the opening of navigation. The length of haul for this rock was about six miles, and the price for hauling $1.50 per ton. At the mine sinking will shortly be recommenced in the old shaft, which is down about 80 ft. A Denver whim has been put in place, the shaft and whim covered in and a commodious blacksmith shop put contiguous to the shaft. A new dining room is also being built, and everything put in readiness for vigorously carrying on active mining operations. Thomas Philbrook is still mining captain.

Beck Mine.—Mr. Beck has an option on this property, which adjoins the Triggs. Captain George McKenzie is still in charge at the mine, and has at present four miners under him. A shaft is being sunk on a promising looking quartz vein some distance to the noathwest of the original shaft. Mr. Thornton, for whom Mr Beck is acting, is expected out from Scotland about the middle of May.

The Sentinel Consolidated Gold Mining Co., Ltd.—The flow of water struck in the Sentinel shot, near Ash Rapids, will necessitate the putting in of a steam plant before operations can be resumed In the meantime the force of miners has been withdrawn and put to work on a property on Camp Bay, adjoining the Bully Boy property and traversed by the Bully Boy vein. The Sentinel Company have obtained an option from the Coronado Company on Mining Locations S. 75 and McA. 73, from whom it may be remembered the option was obtained on the Sentinel mine by the Sentinel Co Captain Proudlock has a contract from the Sentinel Co. to sink 60 ft. on this new property, for $20.00 per foot, the Company supplying the mining outfit, a whim for hoisting and a horse to operate it; the shaft is to be 10 x 6 ft. Until after the opening of navigation the party will have the use of the Bully Boy camps, after which camps will be put up.

Stella—Has a force of four miners at work. It is said that a local man has a sort of option on the property, and will endeavor to put a deal through. No doubt active operations will be resumed at the mine before long.

Treasure.—A force of four men have been working all winter.

Teams are still travelling on the ice of the Lake of the Woods, but in two or three days this must come to an end. The lake will probably open about the usual date.

J. M.

RAT PORTAGE, April 19, 1869.

Payne Mining Co's Dividen s.—The shipments of ore from the Payne mine from 1st Jan , 1899, to 21st March, 1899, are officially reported at 2,638 tons of an estimated average net value of $62.00 per ton. The dividends paid by this company have been :

Dividends paid to 30th April, 1898............. $550,000

Dividends since 30th April, 1898—

April, 1898		$50,000	
May,	"	25,000	
June,	"	25,000	
July,	"	25,000	
August,	"	25,000	
September,	"	50,000	
October,	"	50,900	
November,	"	100,000	
December,	"	50,000	
January, 1899		25,000	
February,	"	25,000	
March,	"	25,000	
			$475,000

Total dividends to date.............$1,025,000

Up to April 30, 1898, the company paid $230,786 duty on lead contents of ore, all of which was shipped to the smelters in the United States. The freight and smelter charges for the same period amounted to $362,986. The company also paid out of earnings $56,743 43 for permanent improvements. Between April 30th and December 31st the company paid $128,786 for duty and $191,562 for freight and smelter charges. The Hall Mines Limited is now adding to its smelting plant at Nelson a smelter for the treatment of silver-lead ores, and the Canadian Pacific Railway has announced its intention to treat these ores at its smelter at Trail. When these smelters are completed it is evident that a great saving can be effected by the Payne Company in freight and duty.