Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

- [X] Coloured covers/ Couverture de couleur
- [ ] Covers damaged/ Couverture endommagée
- [ ] Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- [ ] Cover title missing/ Le titre de couverture manque
- [ ] Coloured maps/ Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- [✓] Bound with other material/ Relié avec d'autres documents
- [✓] Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- [ ] Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- [ ] Additional comments:/ Commentaires supplémentaires:

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- [ ] Coloured pages/ Pages de couleur
- [ ] Pages damaged/ Pages endommagées
- [ ] Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- [✓] Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- [ ] Pages detached/ Pages détachées
- [✓] Showthrough/ Transparence
- [ ] Quality of print varies/ Qualité inégale de l'impression
- [✓] Continuous pagination/ Pagination continue
- [ ] Includes index(es)/ Comprend un (des) index

Title on header taken from:/ Le titre de l'en-tête provient:

- [ ] Title page of issue/ Page de titre de la livraison
- [ ] Caption of issue/ Titre de départ de la livraison
- [ ] Masthead/ Générique (périodiques) de la livraison

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X		12X		14X		16X		18X		20X		22X		24X		26X		28X		30X		32X
																					✓	

R. Bell.

The Canadian Mining Review

Established 1882

Vol. XIV.—No 4 | 1895—OTTAWA, APRIL—1895 | Vol. XIV.—No. 4.

NOVA SCOTIA STEEL COMPANY, LIMITED.

MANUFACTURERS OF HAMMERED AND ROLLED STEEL FOR MINING PURPOSES.

Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel $\frac{3}{8}''$ to $3\frac{1}{4}''$ Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forgings of all kinds, Bright Compressed Shafting $\frac{5}{8}'$ to $5''$ true to $\frac{2}{1000}$ part of One Inch.

A FULL STOCK OF MILD FLAT, RIVET-ROUND and ANGLE STEELS ALWAYS ON HAND
SPECIAL ATTENTION PAID TO MINERS' REQUIREMENTS.
CORRESPONDENCE SOLICITED.

WORKS & OFFICE: NEW GLASGOW, N.S.

AUSTEN BROTHERS.

RAILWAY, COLLIERY AND GOLD MINERS' SUPPLIES.

No. 124 HOLLIS STREET, HALIFAX, N.S.

☞ALL GOODS AT MANUFACTURERS PRICES.

MACDONALD & CO., LIMITED.

——MANUFACTURERS AND DEALERS IN——

PUMPING MACHINERY, IRON PIPES, FITTINGS, &c., &c., FOR MINERS' USE.

Call or Write us for Prices. HALIFAX, N.S.

I. MATHESON & Co

ENGINES, BOILERS, QUARTZ CRUSHING MILLS, GEAR, WINDING GEAR, PUMPING M'CHY STEEL SHOES & DIES. WRITE FOR PRICES.

ENGINEERS AND BOILER MAKERS

NEW GLASGOW NOVA SCOTIA

THE BEST PLACE IN CANADA FOR GOLD MINING MACHINERY

TRURO FOUNDRY & MACHINE Co

Engineers BoilerMakers and Founders TRURO N.S.

GOLD MINING MACHINERY WITH LATEST IMPROVEMENTS

WINDING ENGINES

Special Mixture, Shoes & Dies With the BEST RECORD IN THE WORLD

Wearing quality unsurpassed

ROTARY SAW MILLS.

MINING AND MILL MACHINERY.

Steam Engines, Rock Crushers, Boilers, Derricks, Steam Pumps, Water Wheels, Brass and Iron Castings of every description.

ALEX. FLECK, VULCAN IRON WORKS, OTTAWA.

CARRIER, LAINÉ & CO.,

FOUNDERS, MACHINISTS AND BOILER MAKERS,

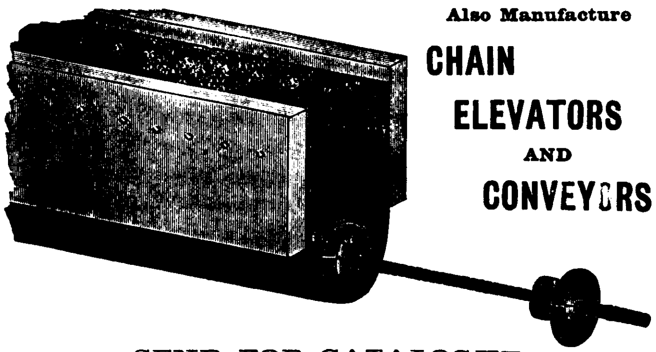
LEVIS, QUE.

Engines, Boilers, Steam Pumps, Hoisting Gear and all Machinery for Miners, Contractors and Quarrymen. Also Builders' Castings, Stoves, Stove Fittings, Hollowware, Flour and Saw Mill Machinery, Marine Engines and Boilers, etc., etc.

WRITE FOR OUR PRICES.

JEFFREY STEEL CABLE CONVEYORS, SIMPLE IN CONSTRUCTION

For Handling Coal, Ores, Chemicals, Refuse, Etc.



Also Manufacture

CHAIN ELEVATORS AND CONVEYERS

SEND FOR CATALOGUE

The JEFFREY MFG. COMPANY, Columbus, O.

Also, 163 WASHINGTON STREET, NEW YORK.

Chemical AND Assay Apparatus

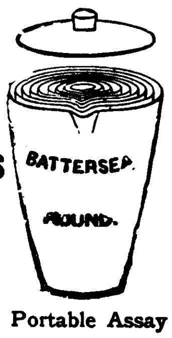
AGENTS FOR THE DOMINION FOR THE

MORGAN CRUCIBLE CO. BATTERSEA, ENG.

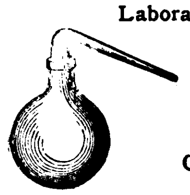
AND FOR THE

ANATYTICAL and ASSAY BALANCES and WEIGHTS

OF BECKERS SONS, ROTTERDAM.



Baker & Adamson's C. P. Acids and Chemicals, Brown's Portable Assay Furnace, Hoskin's Gasoline Blowpipes and Furnaces, Dangler Laboratory Lamp, Microscopes of E. Leitz, Wetzlar, Kavalier's Bohemian Glassware; Royal Berlin and Meissen Porcelain Platinum Wire, Foil, Crucibles and Dishes, Swedish and Rhenish Filter Paper.



LYMAN, SONS & COMPANY,

380, 382, 384, and 386 St. Paul Street, MONTREAL

CANADIAN GEMS, PRECIOUS STONES, ORES & MINERALS.

THE ATTENTION of Students and Collectors is directed to the REVIEW'S Cabinets of Canadian Gems, Precious Stones and Minerals.

No.	No. of Specimens.		
1	30	Canadian Minerals in Box	$ 1 00
2	30	Canadian Minerals in Box, larger	2 50
3	30	Apatite and Associated Minerals in Box	1 00
4	30	Apatite and Associated Minerals in Box, larger	2 50
5	30	Canadian Minerals in Box	2 50
6	60	do do do	3 00
7	60	do do do larger	5 50
8	100	Canadian Minerals in Box	7 00
9	100	do do do larger	12 00
10	100	Canadian Minerals in Cabinet	25 00
11	120	do do do do larger	50 00
12	210	Canadian Minerals, including Foreign Minerals, in Cabinet	100 00
13	30	Ores (Canadian) in Box	1 50
14	60	Ores (Canadian) and Foreign) in Box	5 00
15	60	Economic Minerals (Canadian) in Box	4 00
16	100	Economic Minerals (Canad'n and Foreign) in Box	10 00
17	30	Precious and Ornamental Stones (Canadian) do	3 50
18	60	Precious and Ornamental Stones (Foreign and Canadian) in Box	10 00
19	30	Cut Precious and Ornamental Stones (Canadian) in Box, $10 to	50 00
20	60	Cut Precious and Ornamental Stones (Canadian & Foreign) in Cabinet, $30 to	100 00

In addition to the above, we will make up sets of Minerals to conform with "Dana's Manual," or the work of any other author.

CABINET AND MUSEUM MINERALS.

We can supply single specimens of a great number of Canadian and Foreign Minerals. If you want something especially good let us know, and if we have not got it we will book your order.

CANADIAN MINING REVIEW

OTTAWA, ONTARIO.

MINING LAWS OF ONTARIO.

ANY person may explore Crown Lands for minerals.
Mining lands may be taken up as surveyed locations or staked claims.
Locations range from 40 to 320 acres.
Claims range from 10 to 20 acres on vein or lode.
Locations may be acquired in fee or under leasehold.
Price of locations north of French River, $2 to $3 per acre, and south of it, $2 to $1.50, according to distance from railway.
Rent of locations first year 60c. to $1 per acre, and subsequent years 15c. to 25c. per acre.
Rent of claims, $1 per acre each year.
Claims must be worked continuously.
Royalty on ores specified in the Act, 2 per cent. of value at pit's mouth less cost of labor and explosives.
Royalty not charged until seven years from date of patent or lease, nor (as provided in s. 4 (3) of the Mines' Act, 1892), until fifteen years in the case of an original discovery of ore or mineral.
Original discoverer of ore or mineral on claim entitled to stake out a second claim.
Crown Lands sold under provisions of mining laws in force prior to 4th May, 1891, exempt from royalty.
Copies of the Mines Act, 1892, Amendment Act, 1894, may be had on application to

ARCHIBALD BLUE,
Director Bureau of Mines

TORONTO, May 25th, 1894.

CONDITIONS
OF
Obtaining Government Drill to Explore Mines or Mineral Lands.

Owners or lessees of mines or mineral lands in Ontario may procure the use of a Government Diamond Drill, subject to the provisions of the Rules and Regulations relating thereto, upon giving a bond for payment to the Treasurer of the Province, of costs and charges for (1) freight to location, (2) working expenses of drill, including labor, fuel and water, (3) loss or breakage of bits, core lifters and core shells, (4) wear or loss of diamonds, (5) other repairs of breakages and wear and tear of machinery at a rate per month to be estimated, and (6) an additional charge of $50 per month after the mine or land has been shown, through use of the drill, to be a valuable mineral property.

Of the aggregate of costs and charges above enumerated, excepting the sixth item, forty per cent. will be borne by the Bureau of Mines in 1894, thirty-five per cent. in 1895, thirty per cent. in 1896, and twenty-five per cent. in each year thereafter until the end of 1900. All accounts payable monthly.

For Rules and Regulations *in extenso* governing the use by companies and mine owners of Diamond Drills, or other information referring to their employment, application may be made to ARCHIBALD BLUE, Director of the Bureau of Mines, Toronto.

A. S. HARDY,
Commissioner of Crown Lands.

Toronto, October 17, 1894.

The Canadian Mining Review
Established 1882

Official Organ of The Mining Society of Nova Scotia; The General Mining Association of the Province of Quebec; The Asbestos Club; and the Representative Exponent of the Mineral Industries of Canada.

B. T. A. BELL, Editor. Published Monthly. OFFICES: Victoria Chambers, Ottawa.

VOL. XIV., No. 4 APRIL, 1895. VOL. XIV., No. 4

The Mineral Resources of Cape Breton.

Whenever in Cape Breton the exigencies of the moment require a speech from a politician, a visitor or a lecturer, and like all English-speaking people those of Cape Breton are as fond as any others of a speech, there never fails a reference to the mineral resources of the Island. They are painted in glowing colors, and the listeners hear of every mineral in overflowing abundance; so much so, that the enquirer is often disappointed and unfavorably impressed when he learns that outside of coal these below-ground treasures have hardly been touched. It may not be out of place here to enquire briefly into what substratum of fact there may exist to warrant the glowing prophecies of the well-wishers of the Island.

In this connection allusion may be omitted to the coal fields, beyond remarking that while coal is extensively worked in the Sydney district, there are several other valuable but undeveloped districts.

There are in Cape Breton two geological points which specially present mineral values. The Island is made up of several large and isolated masses of felsitic-gneissic rock, which with granites, altered slates, limestones, etc., have been considered equivalents of the Laurentian strata as typically developed in Quebec, etc. The largest of these masses occupies many square miles, covering nearly all the county of Victoria and the northern part of Inverness. There are also smaller masses in the southern part of Inverness county, in Richmond, and covering the greater part of the county of Cape Breton.

These masses are fringed by and connected by means of strata belonging principally to the lower divisions of the carboniferous. Roughly speaking, this is the skeleton of Cape Breton geology. The mineral horizons in these strata present themselves in part of both of these divisions, and in a marked manner at the points where they are in contact. As may be readily gathered from a glance at a geological map of Cape Breton, these lines of contact are extremely numerous, the narrower masses are lapped on all sides by the newer strata, and the larger masses have long narrow tongues of carboniferous penetrating them for many miles.

These points of contact present manganese ores, iron ores, and when limestones are present the vicinity of the junctions sometimes show ores of lead and copper, veins of barytes, fluor spar, ochres, etc. A district exhibiting strongly these signs of mineral wealth is that of Loch Lomond on the line between Richmond and Cape Breton counties. Here manganese ores are present in quantity which has warranted working, drift iron ore of good quality is abundant, and there are veins of fluor and barytes spar. Along the same line of contact, on the Salmon River, some limestone bands show galena. As yet, however, the manganese alone has received practical attention. The district showing a similar junction from a point some miles north of Cheticamp southerly to the Margaree River yields ores of manganese, iron, and copper. A similar state of affairs exists at numerous points along these lines of contact, and specimens of iron ore, etc., are frequently shown as evidence of unsought value.

In the carboniferous itself are presented enormous deposits of gypsum, outcropping at numerous points, as yet, however, but sparingly quarried at Port Bevis, Grandique and Mabou. The present demand for this mineral, about 150,000 tons, is met by shipments from Windsor to points in the United States. The shipments from Cape Breton, amounting to some 30,000 tons, are to points up the Gulf of St. Lawrence. The future capabilities of this mineral in connection with the fisheries, for the manufacture of fertilizers, etc., should be very great. This horizon yields also abundance of limestone, some of which is adapted for building purposes, and a few tons are annually burned for lime for local use. The source of the exported Cape Breton lime will be referred to further on. There are also known in this formation indications of the presence of deposits of barytes, of lead ore, and of manganese. The brine springs, which have of course great local fame for curative purposes, may be viewed with interest as possible indications of the presence of salt beds. Minerals of the borate family have been observed in the Cape Breton gypsum. In fact, so far as any attention has been paid to the gypsum-limestone localities of Cape Breton with their associated marls, brine springs, etc., there is good reason to believe that they as well as their kindred localities in Nova Scotia proper would in several ways amply repay the attention of capital associated with mineralogical skill. The occurrence of gypsum marks a period of peculiar selective and concentrative chemical energy in the geological sequence which has given great value to certain localities in Europe, and is now being utilized in parts of the Western States of the American Union. It may be added that recent explorations have shown that these measures also yield good building stones, varying in color from red through brown to white, composed of quartz with in many cases a silicious cement. It may be questioned if anywhere in Canada there is a geological horizon so little studied and yet so rich in what pertains to the builder, the miner, the farmer, and the chemical manufacturer.

Our brief review now passes to the older rock masses, the foundation and back bone of the island. At several points are known iron ores, specular, red hematite and magnetite; only a few trenches, however, reveal to us any knowledge of their economic values. At numerous localities drift iron ore promises other deposits, associated with the limestones or penetrating the felsites, etc. In the great mass of granites, felsites, gneisses, etc., covering most of Victoria county, are localities yielding mica, which, although not yet found in workable masses, is certainly promising for further search. Indications of copper ore deposits are widespread, and undoubtedly some of them must be valuable. At Coxheath the work of the past few years in opening up what appeared at first of comparatively little value, has shown that the island contains large bodies of workable copper ore, sometimes enhanced in value by silver and gold. These older rocks also contain shales apparently valuable for plumbago, and by analogy should also carry graphite and phosphates. The latter mineral, as found in the form of apatite, is not at present an export of value from Canada, but if it can be utilized anywhere in the Dominion, Cape Breton would be the place. The limestones of this formation are in places metamorphosed into marble, which is now being placed on the market from West Bay. At this point large quantities of lime are burned, and search may show beds suitable for cement-making, etc. Gold also occurs in these strata, but has hitherto received little attention.

Such, briefly, are the indications of the mineral wealth of the island, and the list is an encouraging one. Remoteness and inaccessibility as well as the attraction of older and better known regions, has diverted attention from its mineral resources. No , however, ready railway and water communication permits of facilitated investigation, and it may be safely said that no district in Canada of equal size, presents equal inducements for the prospector, equipped with proper geological and mineralogical knowledge.

Gold Mining in British Columbia.

In the summary report of the operations of the Geological Survey, for the year 1894, issued this month, Dr. George Dawson, C.M.G., contributes a valuable synopsis of his recent investigations in the placer fields of Cariboo. So much interest is being taken by capitalists in this district that we cannot do better than quote what he has to say in full:

"Although hydraulic mining has long been practised in the Cariboo region, it has hitherto been on a comparatively small scale, and confined to the immediate vicinity of the older mining camps. The isolation of the district from main lines of communication has limited enterprise in this direction almost entirely to what could be done with local resources. During the past summer, however, work on a much larger scale has been actually begun in several places, with results, so far as it has gone, of a very gratifying character. Capital has been interested in this expansion of hydraulic mining sufficient to meet the heavy initial expenses of long ditches and pipe lines with the most approved modern appliances. These operations have already drawn general attention to the extensive gravel deposits of the Cariboo region, which, although less rich than the old channels originally worked by drifting, are enormously greater in area. The country, as a whole, is one well supplied with lakes and streams at every different level, and thus well suited for the hydraulic working of any of the gravels which may prove to be of a payable character

"It is but just to add, that the present renewed interest in the Cariboo district is very largely due to the practical knowledge and advice of Mr. J. B. Hobson; who is in charge of the works of the Cariboo Hydraulic Mining Co., and of those of the Horsefly Hydraulic Mining Co., both of which it is anticipated will be in full operation early next spring It is certain that extensive prospecting work will be carried on next summer in various parts of the district, and it is therefore advisable to give here, some of the more important facts already determined which may be of service to the prospector. During my short visit to the district, attention was chiefly given to the developments made by the two companies above named, and some notes on these will first be given The places referred to will be found laid down on Mr. Bowman's map of the Cariboo mining region, published with the Annual Report of the Geological Survey (new series) vol. III.

"The property of the Cariboo Hydraulic Mining Co. is situated on the south side of the South Fork of Quesnel River, about three miles above the village of Quesnel Forks. It comprises several claims and is believed to cover about 8,500 feet of an old high channel of the river, separated from the modern, deep, and canon-like river gorge, for a considerable part of its length, by an exposed rocky ridge known as French Bar Bluff. Near the lower end of the property, on Dancing Bill Gulch, successful hydraulic mining, on a small scale and with imperfect appliances, has been been carried on for a number of years by a Chinese company. At a distance of about 3,000 feet further east, on Black Jack Gulch, a good deal of work had been done by the South Fork Co., but without effectively reaching the richer gravels, which are below the level of the rim rock where this has been cut through. Short ditches had been made by both these earlier companies, and the exposures in their hydraulic pits afford most of the information obtainable as to the character of the deposits. A ditch with a total length of seventeen miles. and a capacity of 3,000 miner's inches, has now been laid out by the present company and will be completed in the spring. This is to derive most of its water from Polley's Lakes, situated in the hills to the south-eastward. It is also, I believe, ultimately proposed to bring an equal volume of water from Moorhead Lake, by means of a second ditch which will be thirteen miles in length.

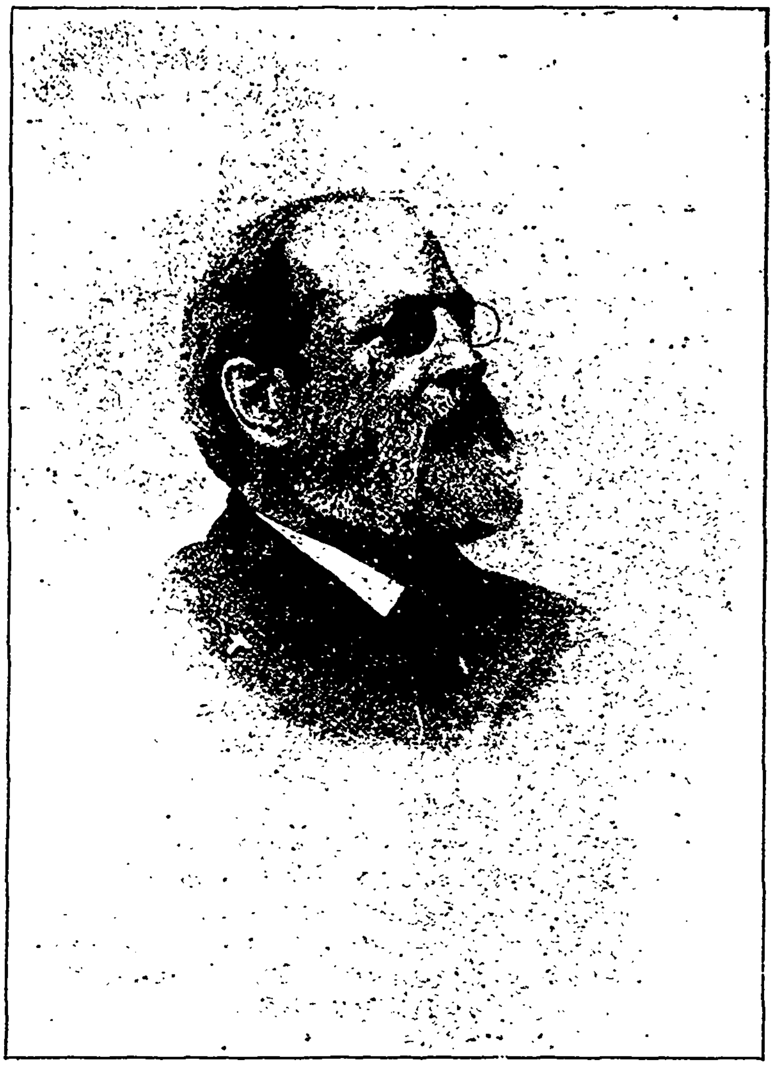
"At the lower or "China pit" the bed-rock of the old channel where cut by the present river bank is believed to be approximately 134 feet above the river. The head of the train of sluices near the working face is 200 feet above the same datum, while the sand box at the top of the bank is at a height of 489 feet; giving a head of water equal to about 289 feet, with ample fall for the dump, which is made direct into the river. Two monitors of five and five and a half inches diameter of nozzle respectively, are established in this pit. Mr. Hobson estimates that the old Chinese company removed in all, about 150,000 cubic yards of the bank, from which, it has been ascertained, $135,000 of gold was obtained, without the employment of mercury, being at the rate of about 90 cents per cubic yard. The scanty water supply available in advance of the completion of the main ditch, enabled a run of only forty-seven hours to be made in the early summer. The mean volume of water employed was 2,000 inches and the yield was 302 ounces.

"The floor of the pit of the old South Fork Co. is about 200 feet above the present river, and bed-rock has been found in test pits at a depth of about 30 feet below this floor, while above it, on one side of the gully, is a nearly vertical face of clay and gravels about 200 feet in height. The head of water from the sand-box to the present bottom of the pit is about 246 feet: but as already stated the rim rock has not yet been cut through to the full depth of the old channel. It is proposed to begin active work here in the spring.

"The geological conditions as displayed in the two pits above described are of great interest, but in the present summary it is possible only to allude briefly to the main facts: In the old South Fork pit, the section in descending order, shows: (1) Ordinary boulder-clay with many glacially striated stones, 60 feet; containing little or no gold. (2) Stratified sands and gravels 120 to 130 feet; yielding gold to the amount of about five cents to the cubic yard. (3) Hard 'lower boulder-clay' with very few glacially striated stones, 30 feet; not known to contain any gold. (4.) Well ronnded gravels, to bed-rock, 30 feet; rich in gold, some prospects obtained from trial pits being as high as $20 to the cubic yard

"In the 'China pit' the section exposed is as follows: (1) Stratified gravels, seen along a portion of the top of the face only, greatest thickness about 30 feet. These contain gold to the amount of about five cents to the cubic yard. (2) Boulder-clay about 100 feet thick, in what appears to represent the axis of the old channel, but running out to nothing on each side; not known to hold any gold. (3) Rather hard roughly stratified gravels and sands, with clayey matter; the stones well rounded and often large. Maximum thickness about 310 feet to bed-rock, minimum thickness (where the overlying boulder-clay is deepest) about 200 feet; rich in gold.

"The gold content of the several deposits, as above stated, results from tests made by Mr. Hobson and communicated by him to me. The equivalency of the strata in the two pits is not quite certainly determined but No. 1 in the 'China pit' is believed to represent No. 2 in the 'South Fork pit,' No. 2 to represent No. 3, and No. 3 to represent No. 4 respectively. The bed-rock appears to be generally a much altered and shattered greenstone (diabase?) penetrated by syenitic dykes and including a considerable body of syenite near the 'China pit.' In regard to age, it would appear that the lower and richer deposit in each pit is pre-glacial, while the upper gravels in the 'South Fork pit' (No. 2) are, certainly, and those in the 'China pit' (No. 1) propably, of inter-glacial origin.



Mr. S. M. ROBINS, General Manager,
New Vancouver Coal Mining & Land Co., Ltd.
NANAIMO, B. C.

"The Horsefly River empties into Quesnel Lake at a distance of twelve miles from the outlet of the lake. Its sources are in a mountainous country to the eastward, but its lower part here particularly referred to, flows northward. A good deal of prospecting and some remunerative mining has been done at different times along this river and its tributaries, and the Harper claims have for many years attracted more or less attention as extremely promising, but owing to various difficulties have not been extensively worked. The Horsefly Hydraulic Company's claims, are situated on the river at a distance of about six miles south of Quesnel Lake, and here very important operations have now been initiated. The river was notably rich in this particular part of its length and the bars had all been worked over by Chinamen some years ago. Mr. McCallum, the discoverer of these claims, rightly believed that the modern placers must have some local source of the nature of an old channel. In search of this he endeavored, by ground-sluicing, to work back in the bank of the river, but finding the ground too heavy for his water supply, eventually drifted into the bank and succeeded in striking the old auriferous gravels. These were at first worked by drifting and afterwards with a small hydraulic plant, supplied from Rat Lake, which is now used as a reservoir by the new company. The mining rights of the discoverer were secured by purchase by the Horsefly Hydraulic Company, and in the course of the prospecting carried out for this company by Mr. Hobson, much has since been learnt in regard to the character and extent of the deposit.

"By the system now successfully completed, water is brought from Mussel Creek, a southern feeder of the Horsefly, by a ditch and pipe-line aggregating over eleven miles and a half in length. The ditch is about ten miles long, with a capacity of 20,000 miner's inches. The pipe-line is steel, 30 inches in diameter, in two lengths aggregating 8,300 feet. There is also about 600 feet of flume. From the sand-box the water is led to the pit by two lines of 22-inch pipe, each of which is intended eventually to supply two monitors. Water is delivered from the main ditch with a head of 168 feet, and from the pooling reservoir with a head of 106 feet. The bed-rock constituting a floor of the pit is about 90 feet above the level of the river, and the working face (60 feet in height at its highest part) at the time of my visit was about 560 feet back from the river bank. The dump is formed in the river itself, which is a moderately rapid stream, capable (particularly in high water) of removing a large quantity of debris.

"Respecting the actual average gold content of the gravels, much has doubtless been ascertained since my visit, some $13,000 being reported as the result of the last "clean-up" The preliminary run made by the company, was estimated to have dealt with 21,333 cubic yards of gravel. It produced gold to the value of $5,000, or at the rate of about 25 cents per cubic yard, but about a third of the area then worked had already been drifted on bed-rock by Mr. McCallum, rendering it probable in Mr. Hobson's opinion, that the unworked ground would average about 40 cents. A small quantity of platinum occurs with the gold at this place.

"The bed-rock in the hydraulic pit consists of pale, Tertiary (Miocene or Oligocene) shales, clays, sandstones and conglomerates, only moderately indurated, and, in general, easily removed by the jet whenever this is required. These rocks contain a few fossil plants and insects, and are inclined in various directions, but their upper surface is a nearly horizontal denudation plane. The working face shows, resting upon them, a thickness of from 30 to 50 feet of gravels, roughly stratified, and varying in character in different layers from almost bouldery material to sand. A few feet near the bottom is irregularly cemented, and some parts of this "cement" is so hard that it cannot be disintegrated by the water. The cementing material is chiefly calcite, but strontianite is found in crusts of half an inch or more in some of the interstices. Stems and fragments of wood are occasionally seen in the lower layers, in a condition approaching that of lignite. The general colour of the auriferous gravels is yellowish, but becomes bluish toward the base. They are directly overlain by a regular layer, of from ten to fifteen feet in thickness, of ordinary boulder-clay which except where covered by later gravels, forms the general surface of the country in the vicinity. In another part of the pit, a local deposit of rather fine, gray gravel is found between the boulder-clay and the auriferous gravel, but unconformable to both. This yields a small prospect of fine gold, but the boulder-clay itself is not yet known to hold any gold.

"The auriferous gravels at this place are therefore distinctly pre-glacial in age, and may, with little doubt, be assigned to the Pliocene period of the Tertiary. While it is probable that they represent an old river-channel, this has not yet been clearly demonstrated, nor is it at all certain that they have any intimate connection with the present course of the Horsefly. The problem is one, not only of great interest, but also of great importance in connection with the future development of the field.

"The upper end of the Harper claims, where some work has been done, is situated about four miles further up the river than the last. Small sections, made in the course of work near the river bank, here show yellowish auriferous gravels, precisely like those of the Horsefly claims and capped in the same way by boulder-clay. Several small shafts have been sunk in this vicinity and part of the river bank and bed has been worked by drifting and wing-damming. The Miocene bed-rock is found nearest the surface at six feet below the river level. Though not thick, the auriferous gravels in this neighbourhood have proved to be exceptionally rich, and they appear to be somewhat widespread. Some miners were engaged at the time of my visit, in putting in water wheels to drain small open-cast workings on the east side of the river; but for the working of the deposit here on a large scale, the hydraulic elevator would probably be the most appropriate appliance.

"Adjoining the Horsefly claims on the north, is the Thompson claim, where the owner has been engaged for some years in drifting into the bank, with the purpose of reaching the supposed continuation of the depression or old channel in which the auriferous gravels of the Horsefly claims occur. The drift is now about 1,200 feet long. It cuts through Miocene rocks like those already described, somewhat flexed, and including a considerable bed of conglomerate, which I was informed, contains a little fine gold. There is no surface indication to show where an old channel may be expected to pass, and it would appear to be advisable here to test the ground by boring in advance of the drift, before this is pushed further in the present direction.

"The notes above given refer only to localities actually visited by me last summer. I hope to give, at a later date, a fuller account of the various deposits seen, which it is impossible to explain in detail without diagrams and sections. Exploratory work is being conducted at present in a considerable number of places throughout the Cariboo district thought to be suitable for hydraulic mining. Further attempts, with better appliances than before, are also being made to "bottom" some parts of the continuation of the well known auriferous channels of the central and mountainous portion of the district.

"Mr. C. F. Law has kindly supplied some details of the work being done on the deep ground in the Willow River valley, in which he is interested. This is the main continuation of the valley of the famous Williams Creek. Near the mouths of Mosquito Creek and Red Gulch, four prospect holes have been bored to bed-rock through the alluvial materials filling the Willow River valley. The bed rock was reached at a depth of from 67 to 109 feet. The old channel was discovered at the depth last mentioned, at a distance of about 500 feet to the southward of the present river, and was found to be capped by a hard ferruginous cement, beneath which is four feet of pay gravel, which from the samples brought to the surface appears to be very rich. Some good payable gravels were also encountered in the side ground, and a shaft, with adequate pumping and other machinery, is now being sunk on the deposit.

"Work of a similar character to the above is also I understand being carried on by the Slough Creek Mining Company, in the valley so named, in which the old channel upon bed rock is reported to have been reached by boring at a depth of 245 feet.

"In an article in *The Province* (Victoria, B.C., Nov. 10, 1894), Mr. Law directs special attention to a gravel deposit on the west side of the Fraser, opposite the mouth of the Quesnel river, which he proposes further to investigate. The deposit is capped by basalt, and Mr. Law very properly draws attention to the probability of its extension, and the existence of others like it in the great basaltic area to the west of the Fraser,* quoting Mr. Hobson's opinion to the effect that the Quesnel river system at a former period (before the excavation of the Fraser Valley), flowed westward to the coast. The gravel deposit here particularly referred to, was first noted by Dr Selwyn in 1875, and a section showing its relations, based on measurements by Mr. Webster, is given in my report for 1875-76 (pp. 257, 263), according to which the base of the basalt capping is about 700 feet above the Fraser or approximately 2,380 feet above sea level. Mr. Law has already ascertained that these gravels contain at least some gold, and from the appearance of the exposures he believes them to represent an old river channel. Should this prove to be the case, it does not, however, follow that the old river flowed westward, it is perhaps even more probable that the general direction of the drainage in this region, was northward, during a considerable portion of the Tertiary period, as I have elsewhere suggested. Attention may further be directed, in this connection, to the notes given in my report already referred to (pp. 263-64), on very similar gravels met with on the lower part of the Blackwater river and elsewhere along the Fraser Valley. Some of these closely resemble the more lately discovered auriferous gravels of the Horsefly, and may be of the same age, although it would not necessarily follow from this, that all are equally auriferous, this being likely to depend on the local source of the gravels in each case.

"Many of the general questions relating to the conditions governing the occurrence of auriferous placer deposits in the Cariboo district as a whole, so far as these are already known, require treatment in greater detail than can here be accorded. It must suffice at the moment, to point out that the late developments have already resulted in greatly extending the area of prospecting and prospective mining, in the manner previously suggested by me on more than one occasion.† The central portion of the Cariboo district,—that in which the highly concentrated auriferous deposits of Williams, Lightning and other well known creeks have been worked—may be described as a mountainous region, surrounded by lower hills and lowlands to the south, west and north. In this mountainous tract, the valleys of streams are deeply cut, and the modern streams still occupy the lines of a very ancient erosion. In surrounding regions the lower portions of the same streams have evidently, at different periods, flowed in many different courses, both before and after the date of the great basalt eruptions; being there subject to changes induced by comparatively slight alterations in relative level of different parts of the country, as well as to many other causes. Where the older channels thus formed, or the gravelly deposits discharged by them on wider areas, antedate the basalt flows, it is now as a rule difficult to find any superficial indications of their existence; but in the case of later streams, and in places to which the basalts have not extended, many of the old valleys may still be found and followed without difficulty. The superficial filling of such valleys, together with the latest changes in the courses of streams, have resulted chiefly from the deposits and effects of the ice of the glacial period, and the study of all the conditions and events of that period has, in British Columbia, a most direct connection and importance in relation to the questions of mining. Allusion has been made to some of these effects in previous reports, but much yet remains to be ascertained and applied, for the problem is essentially a new one in regard to placer mining, no such conditions of a general kind being met with in California, Australia, or any other country in which alluvial gold mining has been extensively prosecuted.

"'The Shuswap series occupies the basin of the Kootanie Lake, from Kaslo south, for at least forty miles. It borders both shores of the lake, in bands varying in width from one to two miles or more. The strike, north of Balfour, is nearly north-and-south, but south of the

*See geological map of a portion of British Columbia between the Fraser river and the coast range. Report of progress, Geological Survey, 1875-76.

† Mineral Wealth of British Columbia. Annual Report of the Geological Survey. Vol. III. (N.S.), p. 45R *et seq.*

EN PASSANT.

The Annual General Meeting of the members of the Asbestos Club was held in the Club House, Black Lake, Que., on Tuesday evening, 25th instant. A full report will be found elsewhere.

We regret to have to chronicle this month the demise of Mr. W. H. Jeffrey, for many years identified with the Canadian asbestos industry, and, until recently, the owner of the well known Jeffrey mine at Danville. Mr. Jeffrey had attained the ripe age of eighty-five and succumbed to a brief illness on Easter morning, at his residence, Newhurst Grange, Richmond, Que. The REVIEW extends its sympathies to Mr. Harry Jeffrey and the other members of the family in their bereavement.

The total output of coal from the British Columbia collieries for the year ended 31st December last amounted to 1,012,983 tons, while 827,640 tons were exported.

The exports of coal from Nanaimo for March are somewhat in excess of February, being as follows :—

Wellington colliery	20,377 tons.
Union colliery	25,066 "
Nanaimo colliery	24,144 "

Mr. John Hardman, M. E., S. B., Halifax, Past President of the Mining Society of Nova Scotia, was married in Ottawa, on 23rd instant, to Miss Lizzie McCarthy, daughter of Mr. Henry McCarthy. Needless to say congratulations are in order.

The value of the imports of mining machinery admitted into the Dominion free of duty during the fiscal year ended 30th June, 1894, was $87,035, of which $2,285 was imported from Great Britain, and $84,750 came from the United States. By Provinces the distribution was as follows :—

Ontario	$39,198
Quebec	13,683
Nova Scotia	26,610
New Brunswick	940
Manitoba	1,322
British Columbia	5,282
Total free of duty	$87,035

Important practical tests of wire rope and fastenings for it have lately been made at the railroad shops in Scranton, by the Deleware, Lackawanna and Western management. The published account shows that 1½ inch steel cables are used in some of their mines, and these tests were made to determine whether or not the fastenings were as strong as the cables. Sockets with taper holes, known as rope cones, to receive the rope, and ending in a fork to fasten the cage, were used, the rope being passed through the hole and the ends of the wires turned back, making a bushy head. Into this mass of twisted and doubled wire, lead or Babbit metal was poured, and the pieces were tested in their regular wheel press. It was soon proved that the rope was amply strong, sustaining seventy tons with no other effect than a reduction of diameter, owing to the compression of the soft centre; lead proved very soft for fastening the wires, they pulling through it, but a composition of three parts lead to one part antimony did far better. The forks sustained load enough to bend steel pins two inches in diameter before breaking, but, when the latter took place a curious fact was exhibited, viz., one side of the fork breaking in two pieces, and one piece about an inch long dropping to the floor, this happening when the load was about seventy tons, but the cross section of the metal was the same where each break occurred.

The Ontario Government has, through the Hon. A. S. Hardy, Commissioner of Crown Lands, voted an annual grant of $300 towards the work of the Ontario Mining Institute We are also pleased to learn that a sum of $500 has been placed to the credit of the Mining Society of Nova Scotia, by the liberality of the Government of that Province. These are substantial and encouraging evidences of recognition of the efforts being made by these organizations to foster and stimulate the mineral development of the country. By and by we hope to record that the oldest and strongest organization of them all, the General Mining Association of the Province of Quebec, has not been forgotten at the ancient capital. The Quebec Government cannot spend $1,000 to greater advantage to the country than by appropriating this amount for the educational work of the Association.

About a dozen students of the McGill Mining School left Montreal on 22nd to spend some time as the guests of President Blue, at the Eustis Mines, Capelton.

A serious shock has been imparted to the confidence of investors in West Australian gold mines by the exposé of the Londonderry fraud. People who rushed to subscribe to the capital of £700,000 on the strength, firstly, of the phenomenally rich specimens which were exhibited in a shop window in the heart of the city of London, and, secondly, on the glowing statements made in the prospectus, and people who subsequently bought the shares at 50 and 60 per cent. premium, on the strength of the statements that were made at the statutory meeting held in January last—statements that read like a fairy tale—will naturally rub their eyes and ask if they are dreaming; if, in fact, it can be true that all the golden wealth that was flourished before their dazzled eyes was a mere phantom of the imagination. At the meeting the chairman said he had been told by Mr. Shaw, the mayor of Coolgardie, that "in eight weeks he could take out five tons of gold." He (the chairman) then went on to say: "The place is sealed up. The gold there is somewhat the same as going into a bank and taking out the sovereigns, and we must be very cautious. * * * The whole is cemented over, sealed and built over with iron, because the place is so rich." A gentleman present at the meeting said that he saw the property before Lord Fingall bought it, had seen the phenomenal specimens which were taken out of the mine, and averred that the stone "which remained after they had been extracted was equally rich." Lord Fingall, in his address said, on the authority of local experts, that the "rich shoot in the principal mine went about 6,000 ounces to the ton, and at seventy feet it went about 600 ounces to the ton;" that "experts there had made a calculation that every twenty feet of quartz similar to what was at the surface should be worth from £300,000 to £400,000." So this marvellous tale went on, and now that the capital has been subscribed and the mine unsealed, the whole thing vanishes into thin air!

Mr. William Garrett, says the Pittsburg Dispatch, made recently the statement that wire nails are now sold so cheaply that if a carpenter drops a nail it is cheaper to let it lie than to stop and pick it up, and it is claimed that one keg out of five is never used, but goes to waste. A statistician figuring this out and assuming that it takes a carpenter 10 seconds to pick up a nail, and that his time is worth 30 cents an hour, remarks that the recovery of the nail he has dropped would cost 0.083 cent. The money value of an individual sixpenny nail is 0.0077; that is, it would not pay to pick up 10 nails if it took 10 seconds of time worth 30 cents an hour. Ordinary men who are not very quick can, however, pick up a nail on a moderately clean floor in five seconds. Assuming that this is a better average than the 10 seconds, and that we are paying the carpenter only 25 cents an hour, it will still cost to recover the nail .0347 cent, which is nearly five times the value of an individual nail. There is, therefore, a considerable factor of safety in the original calculation, and we are bound to believe that it will not pay to pick up nails. Such a calculation brings out clearly the marvellous reduction in prices due to inventive genius. The lurking fallacy is that while it may not pay to stoop for each nail, it still may be worth while for an economical man at the end of his work to stoop once and sweep up in a single handful the nails he has been dropping all day.

As mining in Kootenay reaches a basis of practical work, and the product of the mines goes out into the markets of the world in competition with that from other districts, the need of facilities of different kinds that will lessen the cost of production forces itself to the notice of the miners. Great strides have been made in the matter of transportation, and the matter of fuel is now forcing itself up for attention. Speaking on that point a gentleman recently from the district said: "Kootenay, and even that district west of the Columbia river, want cheaper coal and coke. It is to be had almost at their door in Crow's Nest Pass, but without a railway it might be anywhere else on earth. The C. P. R. and British Columbia Southern have charters to build the line, and the people of Kootenay are wondering now what they are going to do. As an illustration let me point out the situation which confronts the Pilot Bay smelter. The management is importing coke from Washington at a cost of $13.77 per ton, and I believe the first cost is $5 and the freight $8.75. Now a reasonable charge for the same article shipped from Crow's Nest Pass would be $7, leaving a balance in its favor of $6.75 on every ton in comparison with the Washington article, It would perhaps be all right if the American tariff did not go so hard against the shipments of lead from the smelter. Between March 16th and 27th about 600,000 pounds of bullion was shipped to Aurora, Ill. It all went forward in bond to be refined, and for every ton of the lead sold in the United States $20 duty will have to be paid. It went in bond, and will all be returned to Canada, perhaps to Toronto and Montreal. Of course when the smelter has a refinery added it will be independent in the matter of trade conditions, but to compete with the added disadvantage of costly fuel is an unfavorable contest. Kootenay wants cheap fuel and must have it."

In view of the important developments now taking place in our chromic iron deposits in the Eastern Townships, the following from the Australian *Mining Standard* will be of interest: "Chrome mining is being carried on with some success in the Tumut-Adelong district of New South Wales. In the opinion of a Sydney expert, chrome may be found in any part of a serpentine belt 35 miles long by 1½ miles wide, but the bodies are too small to tempt capitalists to operate. Individuals may succeed, however, and the anticipation is that 300 men might earn £3 per week, the article being worth 70s. per ton in Sydney, of which freight, etc., absorbs about 20s. The output during 1894 was about 4,000 tons. According to the same authority, 'The mines have been worked dangerously by men who knew nothing about mining, and it is only a miracle that they were not killed. Even at the present time I would not take £10 an hour and sit in one of them. With one exception there is not a stick of timber in any of them.' The value of these chrome deposits have evidently been exaggerated in London, where it is reported that the assays go over 70 per cent., but on reliable local authority it is stated that the percentage does not exceed 60. In New Caledonia miners are again turning their attention to chrome, although export has never quite ceased from that island. 'The best chrome mine ever known,' says a contemporary, was called the Luck Hit. This, however, had a chequered career, and finally, after producing from 12,000 to 15,000 tons of ore, was closed down as being worked out. A large group of mines in the same district as the Lucky Hit was floated into a company in Sydney, but did not exist long, and the property was eventually sold by auction in Noumea, returning into the hands of the original native owners. The south end of the island has alway been the chrome district; hut deposits havs been worked in other parts though without much success. Years ago a very large deposit was discovered in the north end of the island, but up to the present it has not been worked, although it was laid before many good men in Noumea. There was some hesitation about takidg it up, as the ore was considered to be far too low a grade, and there were serious difficulties in the way of transport. Alluvial chrome mining has been carried on to some extent, but hitherto without success. However, this branch cannot be said to have been thoroughly tried, and undoubtedly large and workable deposits do exist."

The following comparison of the cost of hand labor as against rock drills in tunnel work in a neighboring colony has been furnished us: December 3rd to 8th, 11 shifts, driven 24 ft.; cost, 6 packets gelatine, £3 12s. 6d; 40lb. rackarock, £3 6s. 4d; 16 lb. candles, 8s. 8d; 20 coils fuse, 11s. 8d; oil, 2s. 6d; caps, 3s.; drillers, £5 10s.; helpers, £3 17s.; total £17 8s. 8d.

Previous to the drills being used the contractors were paying £1 10s. 6d. per foot to break the ground, and find their own explosives.

	£	s.	d.
24 ft. at £1 12s. 6d. = ...	39	0	0
Cost by rock drills as above	17	8	8
Saving in favor of machines.........	21	11	4

It is difficult to institute a fair comparison between the cost of hand labor and machine drilling in a short contract. No provision is made, for instance, for interest on the capital represented in the rock drill, nor is any allowance made for wear and tear and supplies. These additions, of course, would not by any means wipe out the wide margin of difference between the two costs, but in a long run they would form an appreciable item.

The newest scare comes from Paris. According to some of our French contemporaries, the Paris Faculty of Medicine have sent a communication to the post office authorities, setting forth the danger of spreading contagious diseases by the use of the telephone. This, it is added, can be prevented by applying to the mouthpiece of the instrument a specially prepared antiseptic paper. If the man of the future is going to spend his time in learning what he ought not to do for fear of the ubiquitous microbe, it is quite certain he will never do anything else. Unfortunately, the microbe appears to be everywhere and in everything, and we can only avoid it by abstaining from eating and drinking and breathing, which is a cheap and simple remedy, but fatally inconvenient.

The largest derrick in the world is said to be that used in the granite quarry of C. E. Tayntor & Co., at Barre, Vt., says *Stone*. Its mast is 89 ft. high, and is held by 10 guys, each running out about 200 ft. to heavy anchorages. The boom can swing around a circle 142 ft. in diameter, and like the mast is built of Phœnix columns. The loads are hoisted by means of a steel wire rope 1¼ in. in diameter, and the boom itself is handled with a similar rope of ¾ of an inch diameter. Over a mile of steel rope was used in rigging the derrick, and its weight, exclusive of the rope, is about 50,000 lbs. It is operated by means of a hoisting engine, and so well are all parts designed that a pull of 300 lbs. at the end of the boom will revolve the whole appliance when the boom is horizontal and loaded with 37½ tons The yerrick has been tested with a load of 57½ tons, although designed to carry only 40 tons; and if the ropes were heavy enough, the remainder of the apparatus has sufficient strength to carry lhads of 80 tons. It replaces a derrick which had a mast and booms of very large sticks of pine. but the largest which could be procured were unable to raise with safety the heavy loads that had to be haddled occasionally in the quarry.

Of special interest to those who are concerned in colliery working are the conditions under which the Belgians manufacture coke from a rather inferior quality of coal, so as not only to be able to use it in their own blast furnaces, but to export considerable quantities in competition with the English coke industry. This is attributed in great part to the employment in Belgium of different kinds of ovens from those ordinarily employed in England, and more especially the Semet and Coppee ovens. In a semet oven it is stated that a ton of coke, which would cost over 18 fr. in the bee hive type. can be produced for rather over 15 fr., showing a sensible difference in favor of the Semet. In the Coppee oven the labor charges attending the production of a ton of coke are stated to be about 11d. as compared with 1s 3d. in the ordinary bee hive system. The Appolt oven is also used in Belgium to a considerable extent, but it labors under the disadvantage of being more expensive in the matter of first cost than either of the other systems named, an experienced authority having given the average cost of installation at 5,000 fr. for the Appolt, 3,000 fr. for the Semet, and 2,500 for the Coppee. The production of coke in Belgium, has, however, made comparatively slow progress of late years In 1873, the output was not more than 1,838,000 tons, and in 1892 it was only about 350,000 tons above that quantity. There are altogether about 2,600 coke ovens of all kinds, but a large number of them are generally unemployed, the cost of production being such that unless the realized price of coke rises above 12 fr. per ton, it does not pay to produce it. The average practice gives from 72 to 74 per cent. of the coal used in the form of coke.

CORRESPONDENCE.

Maps of the Nova Scotia Gold Fields.

To the Editor:

DEAR SIR,—On page 55 of your number for March I observe a paragraph referring to some very excellent maps that were made by Mr. W. Bell Dawson in 1881-82 eastward, *not west*, of Halifax, Nova Scotia, under "*the direction of Dr. Gilpin.*" It is to be hoped that this latter statement was made in error. So far as I am aware Dr. Gilpin had nothing to do with the work, either in its inception or in its direction.

It was commenced in 1881 under my direction, and in part paid for by the Geological Survey. I enclose you copies of two letters on the subject, addressed by me to the Hon. S. H. Holmes in 1881 and in 1882, which I would now ask you to publish as the readiest means of refuting the misstatement and making the truth known.

In view of my letter of 1882 it would be interesting to know why, and on whose advice, this admittedly valuable work was discontinued. In the records of the Depattment of Mines in Halifax a satisfactory reply might probably be found.

I am, dear Sir, yours truly,

ALFRED R. C. SELWYN.

Ottawa, 22nd April, 1895.

COPY LETTERS REFERRED TO.

GEOLOGICAL SURVEY OF CANADA,
OTTAWA, 28th Feb., 1882.

DEAR SIR,—I am now making arrangements for the work of the Geological corps during the coming season, and would be glad to know whether your Government is disposed to co-operate in carrying on the survey of the N. S. gold fields on the same terms as last year. The result of the work if continued will, I am confident, prove satisfactory, and be valuable not alone as an aid to the development of the mines but also in all undertakings where an accurate and reliable map is required.

I am, dear Sir, yours faithfully,

(Signed) ALFRED R. C. SELWYN.

The Hon. S. H. Holmes, &c., &c.,
Halifax, Nova Scotia.

GEOLOGICAL SURVEY OF CANADA,
OTTAWA, May 30th, 1881.

MY DEAR SIR,—I enclose with this copy of letter and estimate of cost for one year of the proposed survey of Nova Scotia gold fields which I received from Mr. W. Bell Dawson on Saturday, 28th inst.

If the terms mentioned meet your approval I would suggest that one half the sum named be paid by the Government of Nova Scotia and one half from the Geological Survey appropriation, and to facilitate payments and dealing with the accounts that you should authorize me to draw on you for the amount agreed on, whenever required, copies of all correspondence, vouchers, reports and other documents connected with the work to be furnished to your Government.

I am, dear Sir, yours faithfully,
(Signed) ALFRED R. C. SELWYN.

The Hon. S. Holmes, &c., &c.,
Halifax, N.S.

COMPANIES.

The Horsefly Hydraulic Mining Company.—The annual meeting of shareholders was held in Vancouver on 13th ulto. The report of the manager was read and considered to disclose a very satisfactory state of things. The report stated that 12 miles of the ditch (to bring water for hydraulic purposes) had been completed, the dimensions of the ditch being 8 feet at the top and 4 feet at the bottom, with a depth of 2 feet 8 inches. There is also 1½ miles of 30 inch rivetted steel pipe. The capacity of the ditch system is equal to 1,800 miner's inches of water, and the reservoir will have storage sufficient for a supply for 28 day's service. The two Giant motors will each deliver 900 miner's inches of water, with a 7 inch nozzle, at a pressure of 160 feet. Five dams have been constructed in connection with the ditch and reservoir system. Additional hydraulic plant will be placed in position during the ensuing season and the work of washing the gravel will be commenced at a second place. The company has erected its own sawmill to supply lumber for building sluices and other works. Already 26 buildings have been erected on the property. The company has acquired 320 acres of farming land for the purpose of providing hay and pasture for its live stock, which at present consists of 21 horses and mules; 13 of these are pack animals, which it has been found expedient to purchase on account of the difficulty of hiring transportation facilities when the forwarding of goods to the mine was a matter of urgent necessity. During the three short runs which were made gold was recovered to the value of $14,000. The total expenditure on the property, including plant, equipment, etc., exceeds $170,000.

Messrs. J. M. Browning, H. Abbott and W. F. Salsbury were elected directors of the company for the ensuing year.

The Cariboo Hydraulic Mining Co., Ltd.—Annual meeting of shareholders held at Vancouver on 13th ult. The report showed that 8 miles of the ditch have been completed and it is expected that 9 miles more will be constructed during the next three months. When completed the ditch will have a capacity of over 3,000 miner's inches of water. The hydraulic plant consists of about 2,000 feet of piping, varying from 18 to 22 inches; two hydraulic "Giant" monitors, with 7-inch nozzles, which will have a hydraulic pressure equal to 300 feet.

As many as 250 men have been employed at one time on the company's works. It is expected that the 9 miles of ditch referred to above, will be completed before the supply furnished by the present ditch is exhausted. Additional hydraulic plant will be placed on the ground this spring and there will then be a supply of water ample for the continuous prosecution of operations.

As soon as the company can conveniently do so, it is its intention to construct a ditch from Morehead and Bootjack lakes. When this is done there will be a permanent supply of water even in the event of an unusually dry season.

A run was made on June 16th last, with 1,500 inches of water for a period of 127 hours, during a considerable portion of which time a good deal of the work was directed to clearing away boulders, etc. The result of the run was 302 ounces of gold, valued at $5,160, which is considered to be a very satisfactory yield. The results secured give ample proof of the richness of the gravel. Had it not been for the excessively hot and dry season, which caused the water supply to fail unusually early, the company would have made an excellent financial showing, even at this early stage of its existence.

The Montreal Hydraulic Gold Mining Co. of Cariboo, Ltd., has been incorporated to acquire from the Montreal and British Columbia Prospecting and Promoting Company, Ltd., certain placer mining leasehold properties and mining claims in the district of Cariboo, and to issue to the said company in payment therefor fully paid up stock of this company to an amount to be agreed upon between the Trustees of the two companies, and to operate the said properties and claims and any other properties and claims adjoining or adjacent to the properties of the company. The authorized capital is $250,000, in shares of $1.00. Head office, Vancouver, B.C. Directors—P. A. Peterson and John Kennedy, Montreal; F. C. Innes, J. M. Browning, and S. O. Richards, of Vancouver.

The Cariboo Gold Fields, Ltd., has been registered under the Foreign Companies' Act, B.C., to adopt and carry into effect an agreement dated the 21st Nov., 1894, and made between the Whittier Gold Concessions, Ltd., of the one part, and W. W. Ellwood on behalf of the company, to acquire and work mining rights, etc., in the Province of British Columbia. Authorized capital £100,000 in shares of £1.

Nova Scotia Coal Mining Co., Ltd., is applying for charter of incorporation. Authorized capital $50,000 in shares of $50.00. Directors: C. F. W. Bell, E. Laurence, W. Macdonald, of Truro, N.S.; A. McKay, Kingston; A. H. Learment, Truro; J. L. Stevens, Kingston L. B. Crowe and A. C. McKenzie, of Truro. Formed to acquire and work coal areas in the Province.

War Eagle Gold Mining Co., Ltd.—Registered at Victoria, B.C., 18th Feb., 1895. Head office, Spokane, Wash. Authorized capital, $500,000 Formed to operate, bond, buy, sell, lease, locate and deal in mines, metals, and mineral properties in the Province of British Columbia.

The Wiegand Gold Mining Co. has been incorporated for the purpose of developing the property on Shoal Lake, near Fort William, Ont. One shaft is already down 14 feet and is under contract to be sunk 100 feet. A stamp mill is expected to be in operation about the middle of next month, with a capacity of 30 tons per day. The officers of the company are: President, Joseph C. Foley; vice-president, V. D. Cliff; secretary, J. J. McAuliffe.

The Vermillion Mining Co. of Ontario.—The annual general meeting of shareholders will be held at office of the Canadian Copper Company, Sudbury, on Wednesday, 15th proximo.

The Providence Gold Mining Co. of Norland, Ltd., has been incorporated in Ontario to carry on operations in the County of Victoria, at the Village of Norland. Authorized capital, $40,000. Directors—Chesley Tomlinson, George Arnold and Thomas Rye, all of East Gwillinbury, in the County of York, Ont.

Kootenay Mining and Smelting Company, Ltd.—This company has at present about 140 persons employed in the construction of its smelter plant at Pilot Bay, B.C. The works are situated on a peninsula nearly in the center of the east shore of the lake. They consist of three main buildings: the smelter, the concentrator, and a building which contains the roasting furnaces. These buildings partially enclose a yard in which are situated the bins containing the ores, lime, coke, charcoal, etc. These materials are hauled from the barges, which bring them to the works, up an inclined plane to the top of the concentrator building. From that point they can be carried to any part of the works or to the bins in the yard, as may be required. There is also an elevator by which the concentrates or other material can be raised to any level that is desired. Besides these buildings there are smith's and carpenter's shops; an assay office and a business office. In the concentrator building are two 9 by 15 Blake crushers, four 4-compartment arch jigs, two double column jigs, two double-deck Buddle tables and two Frue Vanners. The capacity of the concentrator is about two hundred tons per day. In the roasting house are four reverberatory furnaces, each 65 by 17 feet, with a capacity of 12 tons each per day. It is probable a mechanical furnace may be added which would practically double the capacity. The smelter at present consists of only one stack. The arrangements, however, will allow for the erection of two more stacks, and there is no doubt, that if the supply of ore will allow of this addition, the enlargement of the works would put the enterprise on a still better footing for successful financial operation. The smelter at present can treat 100 tons of ore, with the requisite complement of lime, charcoal and coke, which amount to about 40 tons more. In the first week of operation the output of base bullion averaged about 20 tons a day. Of course the quantity will vary according to the character of the ore treated. The power to operate the concentrators is supplied by a 150 h.p. Corliss engine; an 85 h. p. Rider engine works the blowers, while a 30 h.p. high speed engine drives the dynamo which supplies the electric light with which all the buildings are fitted. The ore which is at present being smelted comes from the Blue Bell mine, about eight miles up the lake from the smelter, and the No. 1 mine at Ainsworth. The bulk of the ore from the Blue Bell mine is first concentrated and the concentrates roasted. No other flux but lime rock is required, as the ore carries a large percentage of iron. The Blue Bell mine is the oldest discovery in the district. Years before there was any thought of mining in that district, it is said that the trappers connected with the Hudson's Bay Company dug out lead there and made bullets for their guns in a rude furnace, the remains of which are to be seen to-day. The developments at the mine consist of a tunnel only a few yards from the water's edge, about 1,200 feet long, and which gives access to the various slopes, crosscuts, uprises, etc. Besides this an open cut has been made at the top of the hill, immediately above the underground workings. This cut has laid bare large deposits of carbonates many feet in width, which turn into galena as they descend. The ore as won from the cut is shot down a shaft into the tunnel and thence carried to the wharf for shipment. The magnitude of the output may be judged from the fact that in January and February it amounted to between 5,800 and 6,000 tons. The ore vein has been traced through the Blue Bell and other claims belonging to the Company for a distance of 5,700 feet. Throughout it can be worked economically as regards shipment, as the vein runs almost parallel with the shore. In the driving of the tunnel a seam of copper ore was discovered which gives from 11 to 26 per cent. of copper. The vein is said to be 6 ft. 10 in. in width and it is probable that the Company will add to the smelter special plant to treat this and other copper ores of the district.

Van Winkle Consolidated Hydraulic Mining Co., Ltd.—In his report, referred to elsewhere, Dr. Dawson describes the operations on this company's property in the Yale district, as follows:—

The original Van Winkle Flat, well known in former years as rich placer ground, consisted of the lower river-terraces, from a height of about 100 feet above the river, down nearly to the river level; while river-bars, bare only at low water, were also worked with profit. The work was confined to the upper layers of these terraces and flats, and is reported to have averaged at the rate of about $6 a day to the hand.

The object of the present owners is to work by the hydraulic method, the whole mass of the higher terraces or "benches" which rise from the river in successive steps, towards the base of the mountains on the west. The first principal bench has a height of about 100 feet above the mean high water of the Fraser, the next is about 60 feet higher, and there are others at still greater heights.

The water employed is obtained from the south branch of Stein Creek, and being chiefly derived from the melting snow of the higher mountains, it cannot be depended upon after the weather becomes cold in the autumn. An ample and constant supply might, however, be obtained by extending the ditch to the main stream of Stein Creek. The water is delivered at the sand-box at a height of 377 feet above mean high-water of the Fraser, giving a head of more than 300 feet at the work. The pipe-line from the sand-box is about 1,500 feet long, with a diameter of eighteen inches, and about 1,600 miner's inches of water is employed. A large amount of gravel has already been excavated, the pit taking the form of an isosceles triangle, of which the apex touches the river, the base being at a distance of about 1,200 feet. The ground has not proved so rich as was anticipated, but the working face is now being carried back into the second bench, in which the gravels, wherever prospected, appear to be more highly auriferous.

It is difficult to explain the geological relations of the gravels exposed in this work, without entering into the general question of the deposits of the Fraser valley in greater detail than is here possible. The history of these deposits is traced in the report on the Kamloops sheet, now ready for publication; but as this is the first attempt on a large scale to work the higher benches of the Fraser valley, the main facts may be alluded to. All the gravels here exposed are believed to be later glacial or post-glacial in age. No boulder-clay is seen, nor is any true bed-rock reached. The lowest deposit cut through, consists of well rolled gravels, sometimes bouldery, with a sandy matrix, which pass largely, at a distance from the river-bank, into coarse irregularly stratified sands and fine gravels, occasionally lightly cemented. This deposit appears to represent what now remains of that filling of the valley due to a period subsequent to that of the removal of the boulder-clay by river erosion. It is comparatively poor in gold. When the conditions permitting such accumulation changed, and the river again began to cut down through the deposits above mentioned, it flowed from time to time over different parts of the whole width of the valley, producing the existing series of terraces and benches in the course of its irregular excavation, and leaving portions of its bed at different heights, filled with more recent river gravels. These consist in part of the rearranged material of the lower deposit, in part of materials brought by the river from places up stream. In these old river gravels the greater part of the gold, found at this place, occurs. It is to be noted, that wherever the lateral streams in the immediate vicinity cut through gold-bearing rocks, the lower deposit first described, may be expected to contain a considerable proportion of gold. This should be the case for instance in the vicinity of Lillooet. Of the old river-channels themselves, the higher must in all cases be the older, the lowest and latest being represented by the gravel deposits of the flats nearest to the present stream.

In the Van Winkle pit, the stratified auriferous gravels forming the upper part of the lower, or 100-foot bench, are probably newer than those of the next bench above, which is now being worked into; but this cannot be actually determined till the lowest part of the channel filled by the last named gravel is exposed, and its height compared with that of the 100-foot bench. The older auriferous gravels due to a still earlier period of river erosion, which may be assumed to exist on the bed-rock proper, or whatever may remain of the boulder-clay, must now be altogether beneath the level of the present river.

In the vicinity of Lytton, two companies are also at work experimenting with barges and sand pumps or equivalent apparatus, with the object of working the auriferous gravels of the present river-bed, but no details are available in respect to the result of these operations. Renewed interest is also being taken in the gravel deposits near Lillooet and elsewhere, and there is now every prospect that all such deposits along the Fraser River will be thoroughly examined and, where found satisfactory, worked.

Remarks on Wire Ropes.*

The writer does not intend, in this paper, to deal with the history of the manufacture of wire ropes, as he believes that ground has been already covered by other papers, and it would probably serve no useful purpose to repeat it here; he therefore intends confining himself to giving a few general remarks on ropes, &c., for the consideration of mining students, and particularly to draw their attention to improvements obtained by the Westgarth patent ropes.

It is undoubtedly the first essential property of a good rope, that the steel of which it is made, should be of the most uniform nature; secondly, that the wires should be laid or twisted to form the rope on the most scientific principles.

In the early days of wire rope manufacture, ropes were made either of charcoal or mild steel, having a breaking strain of about 35 and 45 tons per square inch respectively. More recently a "Patent Crucible Steel" having a breaking strain of from 75 to 90 tons per square inch has been largely adopted, but this in turn has been almost entirely superseded by a "Patent Improved" or basic steel, which also has a breaking strain of from 75 to 90 tons per square inch. This material has no doubt been adopted in consequence of its being so much cheaper than the crucible steel. At the present time there seems to be a tendency on the part of users to adopt more generally ropes made of "Plough Steel" (which probably derives its name from the fact that steam ploughing ropes were made of this material), which has a breaking strain of from 100 to 120 tons per square inch. Whether this is in consequence of the patent improved or basic steel not giving results equal to the results of the patent crucible, or the fruits of the very keen trade competition which has led to a considerable reduction in the price of the plough steel quality, is a very debatable point. Probably where haulage systems have been extended to a considerable extent, circumstances have demanded the lightest class of rope with the highest tensile capacity; for such positions plough steel has been found most useful.

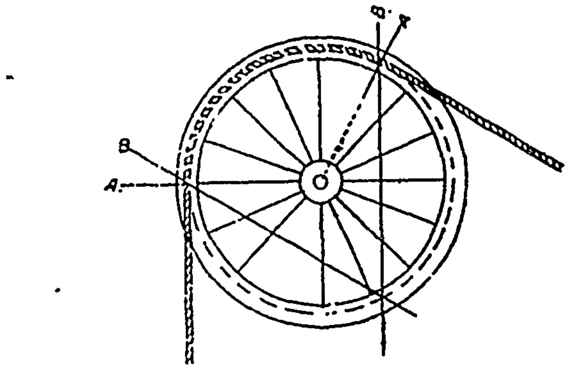
The relative values of ropes of various size made of the afore-named qualities, as far as the breaking strain is concerned, may be seen in the following table:—

ROUND WIRE ROPES.

Bessemer Steel, B. S. 45 tons per square inch.	Patent Crucible or Patent Improved.	Extra Plough Steel.	Equivalent Strength in Tons.
1⅛ in. circ.	....	....	2
1¼ "	1 in. circ.	....	3
1½ "	1⅛ "	....	4
1⅝ "	....	....	4½
1¾ "	1¼ "	1 in. circ.	5½
1⅞ "	1½ "	1¼ "	6
2 "	1⅝ "	1⅜ "	7
2⅛ "	1¾ "	1½ "	8
2¼ "	1⅞ "	....	9
2⅜ "	....	1⅝ "	10
2½ "	2 "	1¾ "	11
2⅝ "	....	....	12
2¾ "	2⅛ "	1⅞ "	13
2⅞ "	....	....	14
3 "	2¼ "	2 "	16
3⅛ "	....	....	17
3¼ "	2⅜ "	....	18
3⅜ "	2½ "	2⅛ "	20
3½ "	2⅝ "	2¼ "	22
3⅝ "	2¾ "	....	23
3¾ "	3 "	2½ "	25
4 "	3¼ "	2⅝ "	28
4¼ "	3⅜ "	2⅞ "	32
4½ "	3⅝ "	3 "	35
4¾ "	3¾ "	3⅛ "	40
4⅞ "	....	3¼ "	44
5 "	4 "	3⅜ "	48
5½ "	4¼ "	3½ "	53
6 "	4¾ "	4 "	67

*Paper before the British Society of Mining Students.

From the student's standpoint, the difficulty no doubt is to ascertain the breaking strain or power of a rope without reference to the various trade tables. It is only necessary however to ascertain the number and sectional area of the component wires and the breaking strain per square inch of the steel of which they are made, and the difficulty of ascertaining the breaking strain of any given rope is overcome with a very ordinary calculation. But for all actual working purposes, it is most advisable to communicate with some good maker, giving all possible data.



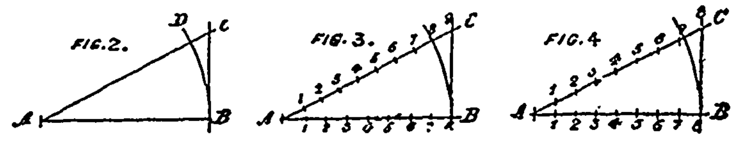
If the breaking strain of any particular rope be desired, without going to the expense of having a proper test made, probably the best way would be to test to destruction a single wire by suspending a weight on it, the result, multiplied by the total number of wires (excluding the centre wires), less 5 per cent. for combination, would give roughly the actual breaking strain of the rope.

Another question which may arise in the mind of the student is, what is the most suitable class of rope for the various classes of work? Generally speaking, the patent crucible or patent improved is probably the best, but the answer in each particular case should be determined by the particular conditions under which the rope has to work. Where the drum and pulleys are very small, probably the milder qualities of steel will be found best, but where the drum and pulleys are large, the higher class plough steel may be used with economy, except in places where there is water.

As regards construction, as will be shewn further on in this paper, there are three distinct classes of work, each of which it is essential should be carefully considered. However, as regards the capacity or factor of safety for winding ropes, for pits over, say 400 yards deep, the breaking strain should be ten times the weight of the working load; under 400 yards, eight times that of the working load; and in haulage or transmission of power, about seven times that of the working load. On self-acting inclines the margin would be quite sufficient if the breaking strain were four times the weight of the working load. Although in general haulage it is very questionable economy to reduce the margin below one-seventh, as it is well-known that there are frequently accidents, which place the rope, with the engine at one end of it and the load a fixture at the other end of it, and in such cases it is generally the rope that has to suffer, even to breakage, through "plucking." It would therefore be very much better if the capacity of the rope were fixed in proper relationship to the developed power of the engine, which can be easily ascertained.

Probably one of the most important points with reference to winding ropes is the angle, both horizontal and vertical, at which the ropes have to work, as it is such circumstances or conditions that determine the amount of friction that will take place on the rope. It would therefore be undoubtedly interesting to the students if some of the members would supply, say the horizontal and vertical angles at which winding ropes are working at various pits, giving the size of rope, nett working load, daily output, and the life-time of the ropes, giving the size of drum and pulleys also. Probably it will be found that, vertically, 30 degrees for the top rope and 45 degrees for bottom rope; horizontally, (*i.e.*, the angle between the centre line of the drum and the centre line of the pulley) about 1 degree, are very convenient angles, and such that will insure a rope-life of at least two years, provided that there are no injurious circumstances to contend with in the shaft.

As to pulleys of suitable size for various sizes of ropes—for ropes composed of six strands of seven wires each, where the rope has not to bend at more than 90 degrees (excepting at the drum), a very common rule is, that the drum and pulleys should measure 1 ft. diameter per pound per fathom of rope, *i.e.*, for a rope weighing 5 lb. per fathom, the drum and sheaves should be, say 5 ft. in diameter. Of course it is



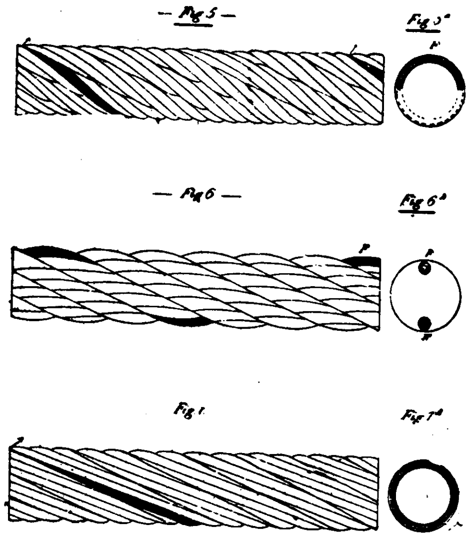
very difficult to lay down a hard and fast rule, as there are such various circumstances to be considered, both as to the quality of the steel and the angles round which ropes have to pass. In many main and tail haulage systems, where the engines are fixed on the surface, it is frequently the case that the ropes work over pulleys at the top and bottom of the pit shaft and round a return sheave, all of the same diameter, whereas there is a difference of 90 degrees betwixt the bend at the top and bottom of the shaft and the bend at the return sheave, and where the tail rope has the work to do, it is most essential that the return sheave should be as large as possible, as the amount of abrasion that takes place—when the return sheave is too small—is most injurious to any class of rope. It is therefore suggested that the foregoing rule may prove quite satisfactory for drums and pulleys at bends of 90 degrees for the plough steel quality of rope, and at bends more acute the sheaves should be correspondingly larger. For the milder qualities of steel ropes the sheaves may be proportionately smaller, provided the working load is also less, so that the higher the tensile capacity of the rope, the larger the pulleys or sheaves should be.

In the transmission of power by the endless rope system, after the question as to which is the best type of driving and driven sheaves has been decided (here again it would be very interesting if those members who have had some experience with endless driving and driven sheaves would submit their testimony on this point), the most important and most delicate point is the tension or tightening arrangement. A very common error is made where the tension sheave is placed immediately after the rope has travelled over the pulley or sheave to which the power has to be transmitted. It is considerably more effective and does less injury to the rope if the tension or tightening arrangement is placed between the engine or driving pulley, some little distance in front of the pulley to which the rope is travelling and to which the power has to be transmitted, *i.e.*, the driven pulley. As it is obvious that the resistance or load is directly against the rope returning to the engine or driving pulley, it is therefore most essential that the rope after leaving the driven sheave should go as direct as possible to the driving pulley; when that is the case the tightening or "tension" is considerably less than in the other case.

In colliery work, the positions in which ropes work may be roughly divided into three distinct classes :—

1st—The overlap winding.
2nd—The underlap winding, and
3rd—General haulage.

Now, the object of the "Westgarth Patent" has been to manufacture such ropes that each wire shall traverse the rope in such a manner that the rope is particularly adapted to each of the above-named classes of work, which is accomplished by, 1st—manufacturing a rope in which each wire is "laid," so that it appears for friction for half a turn on the periphery of the rope on one side only, that is to say, the appearance of any given wire corresponds with itself in every successive twist of the rope in a regular and uniform manner. 2nd—By making a rope so that each wire is "laid" to appear on two opposite sides only, so that when any given wire is bearing on the trod of a pulley the abrasion or compression can only bend the wire directly in the direction of the plane in which the wire is laid through the rope, therefore the wires are never bent across their own axis, and the tension is thereby equalized over the whole sectional area of the rope. This may be more easily understood or appreciated by shewing the amount of expansion that takes place while a rope is passing over a pulley, for instance, where a 5 in. winding rope has to work over a 16 ft. diameter pulley, say for one-third of its circumference between the two squares, that is where the rope reaches the pulley and where it leaves it, there is a difference of 4½ in. between the length of the under and upper circles of the rope, as shewn by Fig. 1. The lines A and B cut each other on the under side or "trod" of the rope, and the divergence between



them (in this case 4½ inches) where they intersect the top side of the rope, represents the amount of the expansion. 3rd—By making a rope in which each wire is "laid" so that it appears for fully one turn, (without contact across the rope's section, or friction. Of course the total frictional surface of a wire in any rope depends on the length and circumference of the rope, but it may be distributed in a variety of ways by different regulations of the twisting, and it is now generally admitted that the greater the length of wire exposed for friction on the periphery of the rope, the less rapid is the process of "crystallization" or decomposition of the steel. This has been fairly proved by a rope 1,700 yds., ¾ in. diameter, having worked out to a cost of ·16d. (decimal sixteen of a penny per ton) against the best previous record of. 18d. per ton on the same position, and by another working out to a cost of ·243d. per ton, against an average cost of. 350d. per ton for the three previous ropes worked under the same conditions. Each of the afore-named types of rope are protected by the Westgarth Patent, dated February, 1887, No. 2701.

Previous to this invention, a number of wires, generally seven, were twisted together to form a "strand," and a number of such strands, generally six, were twisted together to form a rope. The proportion of twist, with few exceptions, being two twists, forming the wires into strands to one twist forming the rope. But this and all other proportions were made without any consideration being given to what is known in the trade as "uptake," beyond allowing a sufficient or necessary length of strand to make a given length of rope, and the result was that the spirals or twists forming the strands were neither coincident nor uniform with the spirals or twists which formed the rope, consequently in every twist or lay of the rope each wire varied in its appearance from any definite line on the rope's periphery. It will therefore be understood that the principle underlying the Westgarth Patent is based entirely upon the fact of the "uptake" which is explained further by diagrams, Figs. 2, 3, and 4:

Fig. 2—Let A B represent a length of rope to be made, and A C the length of each strand required to make the length of rope A B, the arc or circular line D B shews that A B (rope) and A D (strand are equal in length, therefore the portion of strand D C is the extra length of strand absorbed by the twist, or in other words is called "uptake."

Fig. 3—Let A B and A C again represent rope and strand respectively as in Fig. 2. Further, let the several figures represent so many twists. It will be seen that the twists in the strand and the twists in rope are the same length, but on account of the greater length of the strand, there are nine twists in the strand A C and only eight in the rope A B. Consequently, although the length of twist may be the same in the strand and rope on account of the "uptake" in all stranded ropes, there has been, with few exceptions, a greater number of twists put into the strands than in the rope. It is also obvious from this diagram, that in this instance nine twists in the strand would be afterwards laid or twisted into eight. Thus every wire has had a torsional strain put on to it in the course of the manufacture of the rope, as is evident from the figures 1-8 and 1-9 in the rope and strand respectively. The positions of the twists do not correspond with each other, and accordingly the individual wires have varied in their positions in the exterior of the rope.

Again let A B and A C, Fig. 4, represent rope and strand respectively, and the figures so many individual twists. In this instance it will be seen that the number of twists in the strand and rope is the same, notwithstanding the greater length of the strand. It will also be seen that the ninth twist, shewn in the strand, Fig. 3, has been distributed over the preceding eight twists, and it is this distribution which the inventor calls an allowance to the twists in the strand of a percentage equivalent to the "uptake," and it is this principle that enables him to produce the three types of rope illustrated by Figs. 5, 5A, 6, 6A, and 7, 7A, Plate VII.

Figs. 5, 6 and 7, Plate VII. give a longitudinal section with *one* wire shaded to shew the uniform and regular manner in which each wire appears for friction on the periphery of the rope, as marked at F.

Figs. 5A, 6A and 7A, are end sctions to shew as far as possible what is intended to be understood by the terms "one side," "two opposite sides," and "for fully one turn."

Each of the longitudinal sections represents one twist or lay of rope, and every succeeding twist is a repetition of the same.

Mining in Ontario, 1894.

Mr. A. Blue, Director of Mines for the Province of Ontario, is to be congratulated on the promptitude of his issue of the summary report of the mineral production of the Province. The figures, dated 22nd March, are as follows :—

SALE AND LEASE OF MINING LANDS, 1894.

Districts.	No. of Patents.	Acres.	$
Rainy River	29	1,703	3,928 00
Thunder Bay	4	909	1,817 00
Algoma	5	551	1,740 00
Elsewhere	2	108	161 00
Totals	40	3,271	7,646 00

Districts.	No. of Leases.	Acres.	$
Rainy River	48	5,268¾	5,268 75
Algoma	4	298¾	278 75
Nipissing	9	360	285 38
Elsewhere	5	1,123	655 90
Totals	66	7,050½	6,488 78

Received for mining lands sold in 1894	$7,646 00
Received for mining lands leased in 1894	6,488 78
Received rentals in 1894 on mining lands leased in 1891, 1892 and 1893	3,807 78
Total revenue from mining lands	$17,942 56

MINERAL PRODUCTION OF ONTARIO, 1894.

Product.	Quantity.	Value.	Employés.	Wages.
		$		$
Dimension stone........cub. feet	1,340,000	360,470		
Heads and sills...... "	47,070	15,900		
Coursing stone......square yards	22,000	36,000	854	336,700
Rubble, etc..........cubic yards	223,000	142,000		
Sand and gravel .... "	733,500	203,450	175	61,650
Natural rock cement.....barrels	55,323	48,774	63	13,020
Portland cement......... "	30,580	61,060	105	31,858
Lime................bushels	2,150,000	280,000	575	108,000
Drain title ....number	25,000,000	280,000		
Common brick.......... "	131,500,000	690,000	2,375	388,000
Pressed brick, plain...... "	22,460,000	198,510		
Pressed brick, fancy..... "	2,896,000	34,160		
Roofing title... .... .. "	100,000	1,200	209	95,400
Terra cotta....	....	52,360		
Sewer pipe....	....	207,000	56	23,000
Pottery....	....	134,000	160	47,000
Gypsum.........tons (2,000 lb.)	3,253	9,760		
Calcined plaster,etc. "	1,442	22,697	36	9,500
Salt........ .... "	35,215	115,551	135	43,350
Nickel.......... "	2,570½	612,724		
Copper.......... "	2,748	195,750	655	311,719
Cobalt... .... "	3¼	3,500		
Gold.... ....oz......	2,022½	32,776	92	38,032
Petroleum .....imperial gallons	34,912,360	....	....	....
Illuminating oil "	14,349,472	1,337,040		
Lubricating oil. "	3,817,181	242,688		
All other oils.. "	10,632,141	343,416	486	279,930
Paraffin wax... ....lb......	2,754,300	152,467		
Fuel product....	....	71,326		
Natural gas........M cubic feet	1,653,500	204,179	99	53,130
Totals..... ......{1894	....	6,088,758	6,075	1,840,289
{1893	....	6,120,753	7,162	1,935,590

ASBESTOS CLUB.

Annual Meeting of Members.—Election of Officers and Papers Read.—A Successful Year.

The sixth Annual General Meeting of the members of the Asbestos Club was held in the Club House, Black Lake, on 25th instant. The reports of council for the year were adopted, the finances being declared in an excellent condition. Five new members were elected. The ballots on being opened and counted, the following were elected office-bearers for the year 1895-96 :—

President :
Capt. Prideaux.

Vice-Presidents :
L. A. Klein, M.E. and Dr. J. A. Marcotte.

Secretary Treasurer :
Mr. R. Stather.

Assistant Secretary :
Mr. T. H. Crabtree.

Council :
Capt. Penhale, T. A. Poston, George R. Smith, Dr. C. E. Morin, H. J. Williams, W. J. Smythe, John Falls.

A vote of thanks to the retiring officers terminated the proceedings of the afternoon session.

The members and their friends reassembled at 7.30 p.m., the president in the chair. The first paper for consideration was that on

Characteristics of Explosives.

By William Glenn, of "Baltimore Chrome Works," Baltimore, Md.

Having a perfect right to define a word as may best suit our particular uses, and the special objects we have in view, we may define an "explosive" as being a body which when ignited, or when violently shocked, bursts with great energy, or decomposes with great violence. I propose to speak of gunpowder and of nitroglycerine, the two explosives now most in common use ; especially because they happen to be typical of two classes of explosives and of two methods of exploding them.

Gunpowder is a mechanical mixture which when ignited burns explosively ; burns almost precisely as does wood in the stove or oil in the lamp, only its combustion is exceedingly rapid and therefore its total energy is liberated in a brief period of time. Before we can understand what combustion is, and why gunpowder burns with such rapidity, we must first make a short study in combustion.

In the latter part of the last century, Priestly separated from mercury oxide a gas which afterwards became to be known as oxygen. Subsequenty, other workers found this body in ordinary nitre, in iron rust, and indeed in almost all other forms of matter. It exists largely, and in the free state, in the earth's atmosphere. Lavoisier took up Priestly's work and was the first to announce that the burning of wood, of oil, and of all other bodies which burn in air, is due to oxidation alone. For example, he maintained that when wood on the hearth is heated to the kindling temperature, it begins to combine with the oxigen of the air ; and that it continues so to do until it is entirely consumed. All that is left of it is the ash, or the earthy matter which already was oxidised as it existed in the wood, or which forms oxides which are solids under the conditions there present. All the constituents of the wood which can combine with atmospheric oxygen, do so, and form gases which are not visible and which pass off into the air.

As the teachings of Lavoisier are now accepted by all who are in anywise competent to judge of them, we are safe in assuming that combustion is the act of combining with the oxygen gas found so abundantly in the air. During the process, new bodies are formed and these are usually invisible gases which escape unseen into the atmosphere, as in the case of common lamp oil. Generally, there are formed, not only gases which escape, but solid ashes which remain, as in the cases of wood and of coal. But there may result a solid only, as is shown in the combustion of iron. The black smoke seen arising from chimneys consists of minute particles of solid carbon which have escaped oxidation and which are floating away in the arising gases. Wood and coal, indeed all matter which has ever enjoyed life, slowly are decomposed when exposed to the atmosphere, until at last there left only dust. All the remainder is oxidized and escapes as gas. In such cases we discern no liberation of either heat or light. But if the same matter be put into a stove and be there heated to the kindling temperature, oxidation then becomes rapid and both light and heat become evident to us. If for the words light and heat we use the word energy, which means both of them, we may state at once that when a given weight of any substance is oxidized, the total energy set free is under all circumstances the same. In other words, if a ton of coal be permitted to decay in the atmosphere, it will liberate precisely as much energy as it would if burned in a stove, or burned anywhere else. And the same is true of all combustible matter whatever. When oxidation is rapid we can see its effects, when it is slow our senses are too dull to preceive them. But the total energy set free by a given weight of any body is always the same, whether that body be oxidized in an instant or in any other length of time whatever. If a pound of wood could be burned in a drill-hole in the same time as can be burned a pound of gunpowder, the wood whould prove rather the better explosive

All who are in anywise familiar with the subject are aware that the atmosphere is not the only source of available oxygen. Many solids give up readily their content of it, a fact put to practical use in the manufacture of the common parlor match. In one method of this process there is made a mixture of phosphorous with a definite quantity of water ; to this is added potash, chlorate and gum, both of which dissolve in the water present, which should be just sufficient to form a paste when all the ingredients are well rubbed up together. The match sticks are dipped in this mixture and are then dried. If one of them be drawn quickly over a rough surface, there occurs a flash of light and a slight explosion, followed by ignition of the match stick.

While phosphorus is so highly inflammable that it takes fire when exposed to air, it cannot ignite on the match stick because the outer coating of gum protects it. But when the match is struck the coating of gum is broken and some phoshorous is exposed ; at the same time, it is ignited because of the heat produced by friction. The burning phosphorus starts decomposition of the potash chlorate, which in turn gives up about 40 per cent. of its weight of oxygen. This latter burns both the gum and the phosphorus remaining, producing combustion so rapid as to afford a kind of diminutive explosion. In this illustration, it will be seen that combustion of the gum and of the phosphorous is supported by oxygen given up by the solid potash chlorate present. Atmospheric oxygen plays no part in the combustion of the match head, though it afterwards does so during burning of the match stick.

Potash chlorate is one of the many bodies the constituents of which are not held in combination with much tenacity. If it be rubbed in a mortar with organic matter, preferably with starch or dry white sugar, a series of slight explosions are heard and the sugar or starch is consumed. Friction of the pestle against the mortar produces sufficient heat to bring about combustion of the organic matter in the oxygen set free from the potash chlorate ; combustion so active as to amount to a series of sharp sounds. Indeed, if care be not used there is apt to occur a disagreeable explosion of the entire mass contained in the mortar. Bodies which decompose readily, like potash chlorate, are said to exist in "unstable equilibrium."

Potash nitrate, called also nitre or saltpeter, is another body which readily parts with its oxygen. The mineral graphite, or black lead, which is so refractory that it is used for pots in which to melt steel in the steel furnace, may easily be burned in melted nitre. Graphite is a form of carbon, which when exposed to melted nitre takes from it the oxygen it contains, and is itself converted into a gas known to us as carbon dioxide.

Combustion of phosphorous and gum in the parlor match-head, and of starch or sugar in a mortar, at the expense of oxygen abstracted from potash chlorate, and combustion of the refractory graphite in oxygen taken from nitre, are good evidence that some mixtures contain all the elements of self combustion. And he who has heard the explosions which follow when potash chlorate and starch are rubbed together, will thereafter be ready to admit that in some of these mixtures combustion may be so rapid as to amount to explosion.

In starting a fire with wood, the process is begun by splitting a piece of the wood into thin splinters which are piled loosely upon the place the fire is to burn. Upon the splinters, other and larger ones are laid, and lastly small wood is piled upon the splinters. The smallest pieces are ignited by a match and the fire is thus made. There is a good reason for each of these steps. Thin strips of wood are provided for ignition, because experience has taught that it is easier to heat a small object to the kindling temperature than it is to heat a larger one. Moreover, as combustion can occur on surfaces only, the object is to provide as much surface as possible on the wood to be ignited. And by splitting a block of wood into splinters its surface is largely increased.

Wood in the form of sawdust presents greatly more surface than it does when split into splinters. But sawdust does not burn freely, because it lies in such a compact mass that air cannot circulate through it. When sawdust is suspended in air and then ignited, it burns with rapidity. There is a well authenticated case of explosion which arose from ignition of tanbark dust floating in the air of a barkmill in the State of Pennsylvania. In this accident, men were injured, two horses were killed and the mill was wrecked. There were present all the conditions necessary for rapid combustion. The air in the mill was thick with inflammable matter in the form best adapted to combustion. The bark, being in the form of dust, presented the greatest possible surface; and each grain of dust was surrounded by a film of air. When the first grain of dust was burned, it heated its neighbors to the kindling temperature, and in turn each grain was ignited. Thus combustion spread through the mass, and with such rapidity that the effect was at last an explosion.

There have occurred several similar explosions from wheat flour in the air of mills. It was from this cause that the Tradeston mills at Glasgow were destroyed in 1872, and since then two great mills have been wrecked at Minneapolis.

From these instances, the lessons to be learned are these :

1st. That combustion occurs only upon surfaces ; therefore dust burns with great rapidity because it presents the utmost surface for a given weight of matter.

2nd. That combustion when sufficiently rapid produces all the effects which we ascribe to explosion.

As we have learned already, when a body burns it is converted to hot gases which escape into the air. It is a fact easily proven that these gases tend to occupy far more space than was taken up by the matter burned. Every man who has fired a blast in a quarry has indeed proven that for himself. The hotter the gases are, the more space they tend to occupy. When dust in a mill is by combustion converted quickly into hot gases, the simple expansion of the gases bursts the buildings.

Gunpowder is another of the rapid burning mixtures, and much like that on the parlor match head. It consists of a mixture of sulphur and charcoal, which will burn, together with potash nitrate (called nitre), which will decompose and thus set free the oxygen necessary to burn them. These ingredients are moistened and are then thoroughly ground in a mill, which not only reduces them to dust but mixes intimately the dust of them all. The resulting mass is granulated into grains of various sizes, which are then dried.

It will be seen that each powder grain consists of inflammable materials together with a body ready to give up oxygen sufficient to burn them. Moreover, all these bodies are present in the form of dust, the condition in which combustion may most quickly occur. When a mass of such powder grains is ignited at any part, the hot gases of combustion force themselves among the grains and so quickly ignite the whole mass. Combustion is so rapid that it produces the effect we call explosion.

According to the statements of a writer whom we may freely trust, the gases generated by combustion of gunpowder occupy about 300 times the space the powder did ; they occupy that space after the gases are cooled to the ordinary temperature and pressure of the air. As hot gases occupy far greater space than they do when cold, it will be seen that the space occupied by hot gases from burned gunpowder is enormously greater than the space occupied by the powder which produced them. Or to put the same expression in another form : if the hot gases from gunpowder be confined to the space originally occupied by the powder, then will the pressure produced be enormous. Capt. Rodman got pressures of about 185,000 pounds to the square inch when testing the force which bursted bomb shells intended for 12-inch guns. The chambers within these shells were a little less than 4 inches diameter, and they were completely filled with the gunpowder. Applying Rodman's results to the pressure exerted in a 2-inch drill hole filled 8 inches deep with powder, we find that at the moment of explosion the total pressure upon the walls of that 8 inches depth of hole amounts to about two thousand three hundred tons. There is little wonder that rocks are split by blasting them.

Anything which impedes the passage of flame among the grains of gunpowder, causes the mass to burn more slowly. Sawdust acts in this way, and it often occurs that a pound of powder mixed with an equal bulk of dry sawdust will in a drill hole do as good execution as would two pounds of powder. The more slowly burning compound allows time in which the rock may crack, and its fragments begin to move, while with a more rapidly burning mixture much of the explosive force is consumed in simply crushing the resisting walls of the drill hole.

Reducing the powder grains to dust lessens the rate of combustion by decreasing the spaces in which flame can pass through the mass. These free spaces are still further reduced in size when the mass is dampened and then dried, and by pressure they may be so reduced that flame cannot pass through them at all. In that case, they can burn only upon their exteriors, where they are heatad to the kindling temperature

Fuses for bursting military projectiles are made by compressing dampened gunpowder dust into long thin cylinders, which fit in a chamber passing through the wall of the projectile. When the gun is fired, the exposed end of the cylinder is ignited and thereafter burns slowly until combustion reaches the bursting charge within the projectile.

To sum up so far—Gunpowder is an intimate mixture of charcoal and sulphur which are combustible, together with nitre, which will afford the oxygen necessary to their combustion. It always requires appreciable time in which to burn, but it may be in a form which will do so with great rapidity; and therefore it comes fairly within our definition of an explosive; a body which, when ignited, burns with great energy, or decomposes with great violence. It may be made into a mass which will burn slowly, as in the case of a fuse for a military projectile. But in all cases, it can burn without the presence of air, because one of its constituents can supply enough oxygen to afford combustion of the combustible matter it contains. What we have to bear in mind especially is this: that gunpowder always decomposes by combustion, precisely as does wood in a stove or oil in a lamp. This fact separates it from the most important of all of our modern explosives.

The explosive material in a common percussion cap belongs to a class of bodies called fulminates, bodies which are formed by the action of ammonia on certain forms of mercury or silver. All of these fulminates are violent explosives. A sudden shock, or even a scratch from a pin, is sufficient to bring about detonation in this class of bodies. They may be regarded as chemical compounds the elements of which are but slightly held together, so slightly that even a pin scratch affords sufficient agitation to bring about a sudden and total freeing of the bonds which held the elements chemically together.

When a fulminate decomposes, its elements are set free in the form of gases; it is the instantaneous liberation of these highly expansive gases which produces the effect we call explosion.

It must be true that the elements of fulminates are held in chemical equilibrium, or they would not remain combined at all. But the bonds are weak, the equilibrium is easily destroyed. In a word, it is unstable. Slight agitation or shock destroys it, and in an instant the fulminate is converted into highly expansive gases. We may define a fulminate as being a chemical compound which exists in unstable equilibrium, so unstable that slight agitation destroys it and permits the elements of the fulminate to dissociate into gases. It is this instant dissociation which produces the violent activity we observe when a percussion cap is exploded.

The chief difference between gunpowder and a fulminate is this: gunpowder is converted into gases by combustion, requiring appreciable time; a fulminate is converted into gases by simple dissociation of its elements, requiring no appreciable time. It is the suddenness of the dissociation, the setting free of the total energy in an instant, which produces such extreme violence.

Those who have studied the matter say that a musket ball cannot be propelled far by a charge of fulminate. There is indeed developed sufficient energy, but it is consumed in compressing the ball and in enlarging the bore of the musket, but a small part being active in driving the ball forward. The explosion is so sudden that its energy is largely expended before the ball has time to begin its flight.

In the year 1846 Sobrero discovered that when a mixture of strong nitric and sulphuric acids were made to act upon glycerine maintained at a low temperature, there was formed a light yellow, oily liquid, of peculiar qualities. The oil is 1.6 times heavier than water, in which it is insoluble. At 40 degrees Fahrenheit it freezes. When a film of it is struck with a hammer, or otherwise is exposed to sudden shock, it explodes with violence. It acts in the same way when heated quickly to 306 degrees Fahrenheit. But if cautiously lighted by means of a flame, it burns slowly and much as do the ordinary oils. This is the body now so familiarly known to us as nitroglycerine; or somewhat more accurately as glyceriltrinitrate.

Like the fulminates, this body exists in unstable equilibrium. It is a body in which the chemical bonds are weak and are easily destroyed. When this occurs, the mass is instantly converted into comparatively enormous volumes of hot and highly expansive gases. It will be readily understood that it ought to be, as it is, one of the most violent explosives known to chemistry.

The danger arising from the use of a body so readily exploded, caused Nobel, in the year 1867, to search for means whereby its violence might in some degree be lessened. He observed that when the oil was absorbed in sand, it might be handled with comparative safety. When a small mass of the mixture was permitted to fall upon a hard surface, it did not explode. Such a mixture could be kindled with flame and in that way slowly consumed. Evidently, this valuable agent could be brought into general use provided it first were absorbed in sand, or some similar sponge. The difficulty lay in the fact that sand could be made to hold but a small percentage of the oil; if more oil were used, the mass became too soft to handle, and then was almost as dangerous as the pure nitroglycerine. Nobel reasoned that sand could hold only so much oil as would adhere to the surface of its grains. If more oil were used, the mass became partly fluid. He saw that the problem might be solved if only he could get sand each grain of which contained a cavity within it; for then would the grains not only hold the oil upon their surfaces but within the cavities as well.

There were known to exist in Germany beds of what, there, was known as Kieselguhr, and in English, known as infusorial earth. These beds are composed almost entirely of siliceous shells which once were inhabited by minute infusorial animals called diatoms. When seen under a microscope, the shells are found to be of various forms, all of which are chambered something after the form of a snail shell or like the broken pieces of a common clay pipe stem. It was this kieselguhr, or infusorial earth, which Nobel finally hit upon for forming the sponge in which to absorb nitroglycerine. By using as little as one-fourth of infusorial earth, to three-fourths of the oil, he made a mixture in all ways satisfactory to him. He called the mixture dynamite, and so it continues to be called by us. Since Nobel's time, the only change made in dynamite consists in varying the proportions of nitroglycerine and the absorbent: all dynamite is not of the same strength.

Dynamite may be handled with comparative safety. It does not explode when permitted to fall from the hand upon a hard surface. Heavy waggon wheels may in safety be passed over a cartridge of it. It is slow to catch fire, but when inflamed it burns somewhat fiercely. When burned under any pressure, or if a large quantity of it be inflamed, explosion may ensue and likely will.

Both nitroglycerine and dynamite are readily and surely exploded by the shock of a detonating fuse. In ordinary use, an exploder containing mercury fulminate is fixed to a safety fuse, and is then put into the midst of the mass to be exploded. When the fuse heats the fulminate to its dissociating temperature, it explodes; the ensuing shock causes the nitroglycerine to dissociate into its volumes of hot and highly expansive gases. The explosion is so nearly instantaneous that destruction may result before even air has time to move away from before the expanding gases. It is for this reason that large masses of stone may be broken by means of the shock of exploding nitroglycerine which lay uncovered upon the surface of the stone.

Guncotton is another of the high explosives familiar to all the older ones of us. Chemically it is known as cellulose-trinitrate, and, therefore, it stands near to the glyceril-trinitrate which we have just been considering. Both have much the same characteristics.

The salts of another nitro compound, picric acid, form another class of high explosives, all of which are similar to guncotton and to nitroglycerine. All of them explode through dissociation of their elements, and therefore all of them are violent.

The modern smokeless powders are formed from nitro compounds, such as we have just been considering. The effective parts of them are nitroglycerine, guncotton, salts of picric acid, or some similar nitro compound. When exploded, they are converted entirely into invisible gases; there is left floating in the air no solid black carbon, such as happens when gunpowder is burned.

Gold Mining in the County of Beauce, Que.

By Capt. W. Prideaux.

Along the valley of the Chaudiere free gold has been found in nearly all the creeks and rivers discharging into the Chaudiere River from the River des Plantes at St. Francis to the River du Loup at St. George, more especially on the north-east side of the Chaudiere Valley, and in some places extending several miles back through those creeks and rivers.

The River du Plantes Valley has been worked by several companies from time to time, and a large quantity of gold has been taken out.

Following up the Chaudiere Valley to Bertrand Creek, near St. Francis Village, free gold has been found in the alluvial deposits along the banks of the stream. A little above the village is the Poulin Creek where free gold has also been found in several places along the banks.

A little further south is "Devil's Rapids" on the Chaudiere River, and in dry seasons when the water is low, these rapids have been worked by miners in a very small way, for many years.

The method employed is to build small dams so as to turn the water off and clean out the crevices between the ledges of rock, then wash the gravel by panning or with small rockers, and large quantities of gold have been taken from those crevices, and, some very large nuggets have been found at different times, and only last summer a nugget was found by one of the miners which was sold for $53.00.

There are several quartz veins crossing the river at the rapids, and, it is my opinion, that the free gold found in these crevices comes from these quartz veins, and I have no doubt but that some very rich mines will be found there.

Then we pass on to Veilleux Creek, near Gilbert Village, from which alluvial gold has been taken out at several places near its source, and the same applies to Bolduc Creeks, somewhat further on.

The next location is the famous Gilbert River Valley, from which several hundred thousands of dollors worth of gold have been taken out.

I suppose there has been more gold found in this valley than in all the others put together. Several companies and numerous individuals, having worked along this valley for many years, from the Chaudiere up to the end of the third range, a distance of about four miles, and many rich deposits have been found.

In the old channel (or river bed, as the miners call it) the lead varies in depth from a few feet in some places to over one hundred feet in others, so that most of it has to be worked by sinking shafts.

I came out here from England in 1879 to superintend the Canada Gold Company's alluvial claims on the Gilbert river. We commenced work on lot 12 in the second range, and worked through lots 12 and 13 to Concession road between ranges two and three, a distance of between 1200 and 1300 feet and averaging about 150 feet in width. In some places we worked it 180 feet wide.

We sank six shafts on that part of lead, about 200 feet apart, and I found that 100 feet from shaft was quite far enough to wheel the stuff, and we could do the work cheaper by sinking shafts than wheeling long distances. In some of the shafts we met with very troublesome ground to sink through, and it required a practical man, and one that thoroughly understood the work, to get through the quicksands.

In starting our shafts, we first lay two long bearers across the surface, and commenced timbering with sets of 8 inch square timber 3 feet apart, and, always drove our splicing laths ahead. The sets were either hung in chains or one inch bolts, and all the sets bolted together. The shafts sunk by us averaged about 60 ft. to the bed rock.

The first part of the sinking was generally through hard pan or gravel and clay mixed; then quicksands. In some places this was only about one foot in thickness, but in others seven or eight feet. This we found very difficult to sink through, then pipe clay, and after that lead gravel varying in thickness from 3 to 8 feet, to the bedrock.

In sinking our shafts, as soon as we reached the clay we puddled from that to the surface in order to keep the water back, which came through the quicksands, and surface gravel.

The shafts were then timbered by cover binding (or what is termed by some miners, grovendering), when the shaft is bottomed or bedrock reached we commenced drifting in opposite directions from the shaft.

The size of drifts are usually 6 feet high by 8 feet wide, and timbering is first done by laths put across the drifts supported by 4 inch temporary posts. When we had drifted 10 feet we cleaned the bedrock, then put up two caps of about 12 or 14 inch square timber, and two posts under each cap of the same size, standing on the bedrock, which is generally slate. When the main drifts were run about 50 feet from shaft, we commenced cross-cutting and blocking out, and after a few drifts are worked out around the shaft, the weight becomes very great on the timbers, and we had to build stone walls under each cap in the main drifts to keep these open for wheeling through and it required two men constantly employed about that work.

We drifted about 30 feet, and cleaned 240 square feet of bedrock in twenty hours work, producing on an average about 56 cents per foot, or 7½ ounces per day.

The part of the lead we worked on was, however, not as rich as some other parts in the valley. Many large nuggets have been found along this valley varying in size from ½ to 7 or 8 ounces, others having brought as high as $450 to $1,000 per nugget.

Most of the alluvial lead along this valley, I think, has been worked out, but I do think if capitalists could be induced to come in, and work the quartz veins, rich mines would be found and large profits made, as the fact of so many rich deposits of free gold having been found along this valley from the Chaudiere to the third range, leads me to the conclusion that there must be some very rich quartz veins somewhere in the neighborhood from which this gold comes; as my experience was, that wherever we crossed a quartz vein (large or small) we got better pay than at any other place.

I came across one small vein of decomposed quartz, about 10 inches wide and sunk about 8 feet on this vein, and every pan that I washed produced a large number of small colors of gold, and when that is found at a depth of 8 feet I think it shows that the gold must be produced from the quartz.

On the hills above this valley there are also several quartz veins, in Ranges 5 and 6, which run back through the Township of Cranbourne. Some of these veins produce gold, on one of which I had some work done, (which is quite 6 feet wide,) and a sample from it assayed by Dr. Donald, of Montreal, produced $23.00 in gold to the ton.

Some two or three companies have operated on the Cumberland Valley, in St. George's; several shafts have been sunk along the banks of this stream and gold found in some of them, but I understand not in paying quantities. I am, however, of the opinion that the main lead has not been struck in this valley.

The Famine River Valley has been pretty well explored for several miles back from Chaudiére, but no deep leads have as yet been discovered. Parties have worked near the Falls and taken out quite a lot of gold, and there was a shaft sunk near the junction of the Famine and Beneka Rivers, and some nice coarse gold found at the bottom. They drifted a short distance, but did not find much, so it was abandoned.

The next creek south of Famine River is at St. George's Village. On this creek about one mile back of the Chaudiere there was a deep shaft put down. It was reported that they found lots of gold, but I am doubtful, as it was soon abandoned.

On the River du Loup, above Jersey Point, operations have been carried on by several companies, and a large amount of gold is reported to have been taken out. Mr. Blue, of Capelton, I understand, is now testing some of the veins along the banks of this river, and the chances are that he will strike something good.

The finding of so much gold in all the rivers and creeks with so many promising quartz veins traversing the hills above, I do not think there is a richer district for gold on this continent, or one more worthy the attention of capitalists, than the county of Beauce, and the time will no doubt come when there will be a rush to this country for gold properties.

Explosion by Lightening at a Nova Scotia Colliery.

In a recent paper before the members of the McGill Mining Society, Mr. T. Farmsworth, Westville, gives the following particulars of the explosion a few years ago at the Drummond Colliery, Westville:—

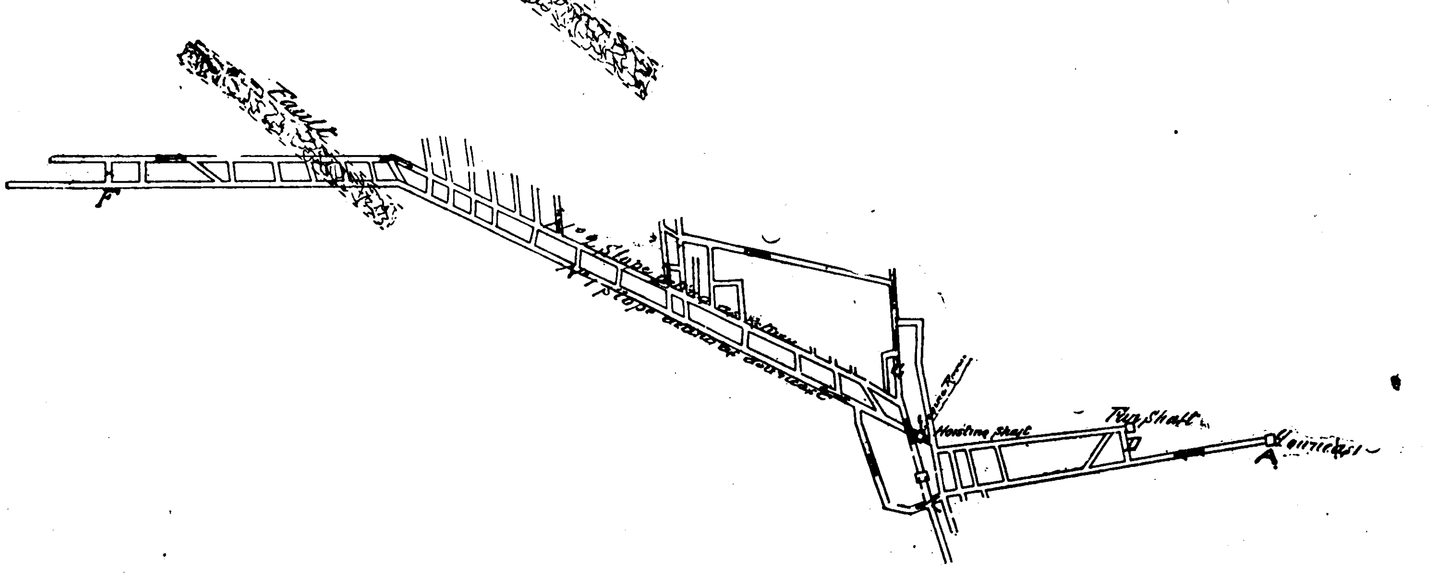
Personally I have not read of any mine explosion having been caused by a thunderstorm. In the present case I shall be able to lay before you, and as concisely as possible, indisputable facts of one mine explosion having been caused thereby. I wish to refer briefly, however, to a peculiar phenomenon which occurred some years ago at the Kibblesworth Colliery, England, during a very heavy storm. An electric current undoubtedly passed down the slope and into the mine. The rope on the slopes travelled at a very slow speed, but with a heavy load. The working load of the rope at the time was 40 full tubs or boxes and 40 empty ones. The average force tending to move the rope would consist of the weight of the coal in the full boxes multiplied by half the total rise, and by the rate of doing the work. The weight of the coal roughly was some 40,000 lbs. This was raised 33 feet vertically in 18 minutes, which would give about 2 h. p. In the ordinary routine of working during this storm the rope with the load came to a halt, the men and the boys employed in the mine received shocks, consequently electric currents must have passed through them. Especially is the case of one boy clearly illustrated. This lad, a brake holder, received a severe shock, having his hands on the brake and his feet on the rails he must have been one of the joining points or objects between which an electro-motive force existed, the rope being charged one way say positively and the coals, rails, etc., negatively. It is probable, too, that some of the most powerful shocks were produced by redistribution going on at the time owing to the clouds having flashed and so altered their electrical condition. The case, however, of putting a stoppage to the load seems to me a most peculiar phenomenon and worthy of consideration. Mr. Lougden, Engineer, England, gives his reason as this: 'There are 320 wheels in all on the tubs, leaving out of account the rope and its pulleys. Supposing therefore an attraction to be set up between each individual tub-wheel and its rail, due to the existence of electro-static charge, assisted possibly by very minute traces of magnetism, it is by no means an impossible contingency that the aggregate holding force should be sufficient to hold the rope.' Something of this kind evidently must have been the cause as the rope moved on immediately the inducing force was removed.

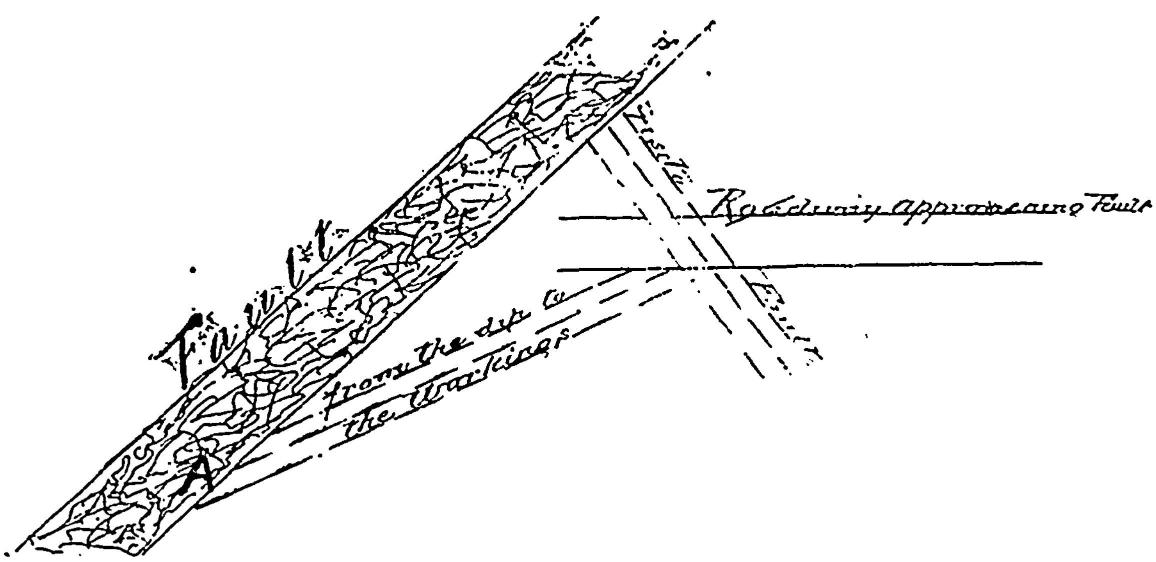
In passing on to the case of an explosion having been caused by one of these electric storms, I must first give you a brief description of the state of the mine for some short time previous to this, and enclose tracings of portions of the workings on an enlarged scale.

For some few months all work had been abandoned, no decision having been come to as to a thorough and comprehensive system of laying the workings out to the best advantage, having three faults or dykes to contend with. The lower or deep fault when struck in the sinking of the slopes, gave off considerable feeders of gas at a very high pressure, showing that a large draining ground had been opened out by the piercing of this "step." This was proved by the fact that at the last cross-cut in the slopes, marked F on plan, there was an air current of 20,000 cubic feet per minute with a velocity of 350 feet per minute; notwithstanding this strong current, and really only ventilating two working faces the back or return slope was very heavily charged. The slopes were sunk some 1,200 feet after passing through the trouble, but the angle the course of the slopes made with the course of the fault not being great, the whole of this distance was simply one drainage ground. In speaking of gases coming at pressure from faults should you know the dip and course of the fault particular notice should be taken of the manner in which the "lips" or smooth faced fissures come in when approaching the trouble in your workings. Below I give a sketch which will better illustrate my meaning. In one case you will note the "lip" running upward and toward the fault from your workings; you will in this case, in all probability, not encounter much difficulty unless the gas be pent up at high pressure. In the other case you will note that the "lip" commencing say at point A rises from thence up toward your workings, thus forming a natural drainage ground of itself, more special care being needed in the matter of your ventilation.

During Friday, the 8th day of August, 1893, a heavy storm of thunder passed over the neighborhood of the works and simultaneously with a destructive flash of lightening the mine exploded with a terrific force completely demolishing a cupola 60 feet high over the fan shaft, tearing asunder the wrought iron tubes connecting the mine with a Schiele ventilating fan. The current was seen to strike the steel wire rope which hung down to near the bottom of the shaft and on which hung the cage for raising and lowering men and material; from this shaft were placed water column pipes leading into the mine from the shaft and down the sinking slopes into the workings. This inductive force evidently passed down the rope and from thence to these pipes and then into the workings igniting the already formed gaseous mixture. About three minutes after the explosion occurred dense volumes of smoke emerged from the three shafts. Thinking the workings were on fire it was decided to seal the mine up entirely. This was done by first battening down the downcast shaft marked A and then simultaneously the hoisting and fan shafts. The reason for this course was that by first stopping your main intake you robbed the mine of a large portion of fresh air needful for combustion and thus lessened the possibility of a second explosion taking place. In putting in the stoppings at the mouth of each shaft squared timber, 10 inches diameter, was used, and over this 3 to 4 feet of clay well rammed was placed, thus excluding all air and damming back the smoke and "after damp" into the workings.

The first commencement to open out and recover the mine was made by way of the fan shaft, this so as to make every preparation as speedily as possible for the restoration of the ventilation. The method adopted after careful consideration was by first removing from the top of this shaft a small portion of the clay, then with an auger a small hole was made through the timbers and chiselled out to about 3 inches square; through this aperture a self-recording thermometer was run to the bottom of the shaft and the temperature (57 deg. F.) noted. The mixture exuding from this hole gave us 14.7% of CH_4 and at a very high pressure. This gaseous compound of carbon and hydrogen more nearly approached the nature of illuminating gas than that of fire damp, a large percentage of air being needed to make an explosion possible. A pipe was then erected 12 feet high, carrying the gases well into the atmosphere. You will perceive from this the necessity of exercising the utmost care in dealing with mining trouble of this kind. The shafts were left in this condition for three days, then as the pressure and nature of the exuding gases had changed and no smell or other sign of fire was noticed, the whole covering was removed and a commencement made to build up the crib work, to restore the ventilation, and make a descent into the mine. A commencement to run the fan was made some three weeks after this and a descent commenced by way of the downcast shaft. Previous to the explosion there were two check doors in the cross-cut, marked D on plan, to enable persons to travel from the intake to the return; these were totally destroyed. No air, however, was noticed travelling through this headway and thus by a very short circuit to the fan. It was, therefore, naturally concluded that a fall of roof must have occurred, closing up the roadway. This was not the case. A direct, clear passage existed to the fan shaft bottom. Notwithstanding this no perceptible amount of air travelled this the natural course. From this point to the second main landing down the shaft slopes each successive stopping was demolished, the greater part of them being three feet in thickness. Here, then, we have another phenomenon confronting us. Notwithstanding the fact that there were short circuits in which the air could travel from the intake direct to a fan of 30,000 capacity, yet we find it taking the longer course down the mines and through the workings and thus defying all the known laws of ventilation. If you gentlemen in your discussion can throw light on this point, I, with others, will be benefitted thereby. I am sorry not to be able to give you the two temperatures, that of the in-bye and out-bye air, as from this I think we might formulate a reason. It is certain the air entering the mine and when passing this roadway D would be much heavier than the return air passing from the mine and up to the fan. This difference of density must have been the chief reason, that is, it was less work for the fan to take this light air from some 3,000 feet down the workings than to take the heavier air along this narrow circuit and lift it up the shaft. The chief falls of roof were found in the immediate vicinity of the hoisting shaft.





At the point shown on plan, and colored red, four separate and distinct forces seem to have met. Here you will notice a point marked as engine room: this engine having been used for hoisting the coal up the slope, colored blue. On the high or return side of this room a stopping was erected in which a regulator was placed to air the engine room. This stopping was blown outward from the return side and through the engine room: then came another force from the district marked G and shaded green, then the two forces from the No. 1 and No. 2 slopes: each of these forces meeting at the point shown did considerable damage. A small boiler placed here and used as a steam receiver was carried bodily at least 30 feet. Although at this particular place no sign of fire damp could be detected on the lamp, that is on the level road, yet when climbing over the top of one of these falls of roof, our lamps perceptibly brightened and an immediate sensation of weakening at the knees was felt, accompanied by dizziness in the head, caused by breathing the carbon mon-oxide C.O. laid in this high cavity and produced by the imperfect combustion of the particles of coal dust floating in the air at the time of the explosion: this gas in the sluggish state of the air current stratifying naturally and remaining in these high and abnormal excavations in the roof.

Here then we have several points worthy of consideration in dealing with any explosion more especially when you have a fear of mine fires and you find it impossible to penetrate the workings immediately.

1st. The careful closing of all openings, studying the most secure and least dangerous method of doing so, then deciding quickly and unalterably (no indecision) the mode of procedure.

2nd. Equal care to be bestowed in the re-opening so that you may ascertain by all existing means the nature of the air of your mine and its temperature.

3rd The careful starting of your fan and restoration of ventilation. In case of any smouldering fire the commencement of your air current means another and probably more disastrous explosion than the first.

I must say in conclusion that we were favorably situated as regards the closing down, no lives being in the mine, consequently no time need be lost in trying to recover them, which would in this case have been impossible and useless.

I may say that the total damage was comparatively slight, due no doubt to having three openings to the surface by which the force generated could be expended.

The Phosphate Trust.

Boodler Sando Examined in Bankruptcy—More Side Lights on Phosphate Finance.

Our readers who have followed the REVIEW'S report of the doings of the General Phosphate Corporation, (Ltd.) from the date of its inception to its liquidation will be interested in reading the account of Sando's examination in bankruptcy in London last month. Mr. Knud Sando, the promoter of the swindle, appeared before Mr. Registrar Hood, and said he wished to deny the statement which had been made that he was an undischarged bankrupt when he was negotiating with the corporation. He had received an order of discharge immediately upon applying for it, in 1880, to the New Zealand Court He came to England about the beginning of 1887 The Phosphate Trust was proposed about September, 1889, another scheme having fallen through He had made a study of phosphates, and came to the conclusion that the industry was a good one, and he decided to make an effort to form a company to take it up and work it. He discussed the matter with Messrs. Francis and Johnson, and it was decided to organize a company with a capital of £1,000,000. The late Mr. Hume Webster agreed to promote the company Witness was acting as the agent for owners of Canadian phosphate properties.

The original intention was that the Phosphate Trust should purchase certain properties in Canada, covering about 11,000 or 12,000 acres. Under this scheme the directors were to be bound to purchase the properties: but the proposed directors declined to agree to this course, preferring to be entirely unfettered in their choice of properties. In March, 1890, the whole scheme was dropped and a new one entered upon, the company being eventually called the General Phosphate Corporation (Limited) Witness held several options from phosphate property owners, under which he was to receive commission if sales of the properties were effected.

The "Ross Mountain" group was purchased for £55,000, and when the directors informed him that they were favorably impressed with the property he saw the Hon. C. C. Colby (the vendor) and arranged that he should receive as commission an interest of £5,000 in the mortgage which was executed upon the purchase. The "High Falls" group was acquired by the company for $40,000, and witness received as commission an interest of £11,000 in the mortgage of £30,000 on the property which was executed to secure the balance of purchase money. Before he left Canada in September, 1890, witness gave Mr. Deeley 20 founders' shares, representing £1,000, for services entirely outside the company Sometime afterwards he agreed to buy the shares from Mr. Deeley for £1,000. Mr. Deeley had used his influence in obtaining the co-operation of two members of parliament in a large colonization scheme to which he was giving his attention. He had no knowledge of any commissions having been paid by the vendors to the experts who reported on the various properties to the company.

Under a contract dated June 12, 1890, witness undertook to obtain subscriptions for 300 founders' shares, representing a total amount of £153,000. On July 4 following applications were made for 183 founders' shares, representing £93,330. At the board meeting held on that date it was resolved that 117 founders' shares, representing £59,670, should be allotted to witness on the condition that his cheque for £6,000 was honored. At that meeting the directors declined to go to allotment until he had completed his contract. Witness then offered to apply for the shares on his own account, and the directors agreed to this subject to his giving a cheque for £6,000. He told the directors that he had not the money at his bank, but would make arrangements to meet the cheque.

The Official Receiver—What was your financial position at that time?

Witness—I had all the money that I wanted. (Laughter.)

Continuing, he said that he paid £500 in cash and gave 20 founders' shares for an advance of £3,000, which he repaid within 18 days. He asserted that it was a very common occurrence for 300 to 500 per cent. to be paid for advances in respect of preliminary expenses of companies. He borrowed the money to pay the registration fees He had a group of persons around him who financed and assisted him and who received a share of the profits. The directors knew that he was receiving a commission, but they never asked him what it was, and he never told them.

The inquiry was adjourned until May 7 next.

ONTARIO MINING INSTITUTE.

Second Annual Meeting.

The second annual general meeting of the members of the Ontario Mining Institute was held in the School of Practical Science, Toronto. The opening session was held on Wednesday afternoon, 10th April, when Mr. W. Hamilton Merrit, A.R.S.M., F.G.S., in the absence of the President, occupied the chair.

After the Secretary had read the minutes of previous meeting, the following were elected to membership:—

New Members.

Mr. J. Burley Smith, M.E., Glen Almond.
Mr. Frank Darling (Canadian General Electric Co.), Toronto.
Mr. Herbert C. Hammond (Osler & Hammond), Toronto.
Mr. W. E. Housted (School of Practical Science), Toronto.
Mr. J. W. Shields (School of Practical Science), Toronto.

Mr. G. R. Mickle, M.E., Sudbury.
Mr. W. A. Parks (Biological Building), Toronto.

Amendments to Institution and By-Laws.

On motion of the Secretary, the following amendments were adopted:—

SECTION III.

PAR. III.—"The Institute shall consist of Active, Associate, Honorary and Student Members."

PAR IV. -That the paragraph be changed to read "Active Members," instead of "Members," as formerly.

That a new paragraph be added as follows:—"Student members shall be persons who are qualifying themselves for the profession of mining metallurgical, mechanical or electrical engineering, or other branches of engineering, and such persons may continue student members until they attain the age of twenty-five years. They shall have notice of and the privilege of attending all meetings and excursions, and shall have all the privileges of the Institute, except voting. Student members shall pay an annual fee of one dollar."

SECTION V.

That the membership fee be three dollars instead of two dollars.

SECTION VIII.

That a general meeting, for reading and discussion of papers, be held once in each year, instead of twice as formerly.

Treasurer's Report.

Mr. T. W. Gibson submitted his annual report, showing a balance on hand of $14.50, with assets and liabilities about even.

The report was adopted.

Secretary's Report.

The Secretary—A year ago to-day our Institute was organized, with a membership of 37. It has grown to 79, or an increase of 42, during the year. Meetings have been held as follows:—

Rossin House, Toronto, 10th April, 1894, one session; Private Bills Committee

Room, Toronto, 12th and 13th September, 1894, four sessions; School of Mining, Kingston, 3rd and 4th January, 1895, four sessions.

Ten papers had been contributed to the proceedings as follows:—

(1.) The Utility and Value of Some Common Minerals, by Mr. A. Blue, Director of Mines.
(2.) The Nationalization of the Mineral Domain of Ontario, by Mr. J. Bawden, Kingston.
(3.) The Rainy River Gold District, by Dr. A. P. Coleman, Toronto.
(4.) Nature's Concentration Works, by Dr. W. L. Goodwin, Kingston.
(5.) Gold in Ontario and its Associated Rocks and Minerals, by Dr. A. P. Coleman, Toronto.
(6.) Boron: Its Detection in Minerals and Uses, by Prof. W. Nichol, M.E., Kingston.
(7.) Notes on the Merchantable Mica of the Laurentian, by Mr. Hamilton Merritt, A.R.S.M., Toronto.
(8.) Notes on the Glendower Iron Deposits, by Mr. W. G. Millar, M.A., Kingston.
(9.) Notes on the Silver Deposits of Thunder Bay, by Mr. Peter McKellar, F.G.S.A., Fort William.
(10.) Notes on the Diabase Dykes of the Sudbury District, Ont., by Mr. T. L. Walker, M.A., Kingston.
(11.) Typical Ontario Rocks (illustrated by lantern microscopic views), by Mr. W. G. Millar, B.A., Kingston.

The other feature of the year's operations was the scheme of federating the various mine organisations, which had been considered and approved by the Institute, and had been finally adopted by the other societies.

Election of Officers.

PRESIDENT.

Mr. James Conmee, M.P.P., Port Arthur.

VICE-PRESIDENTS.

Mr. James McArthur (Canadian Copper Co.), Sudbury.
Mr. Ian Cameron, Sudbury.
Mr. Peter McKellar, F.G.S.A., Fort William.
Mr. J. J. Kingsmill, Q.C., Toronto.

TREASURER.

Mr. T. W. Gibson (Bureau of Mines), Toronto.

SECRETARY.

Mr. B. T. A. Bell (Editor Canadian Mining Review), Ottawa.

COUNCIL.

Mr. A. Blue, Director of Mines, Toronto.
Dr. A. P. Coleman (School of Practical Science), Toronto.
Dr. W. L. Goodwin (School of Mining), Kingston.
Prof. Wm. Nicol (Sccool of Mining), Kingston.
Mr. F. Hille, M.E., Port Arthur.
Mr. R. W. Leonard, C.E. Kingston.
Mr. J. F. Latimer, Toronto.
Mr. W. Hamilton Merrit, M.E., Toronto.
Mr. T. D. Ledyard (Ledyard Gold Mines), Toronto.
Mr. Thos. Shortiss, Toronto.

The following papers were read at this and the other sessions of the Institute.

Determining the Value of Gold Ores in the Field.

By R. W. LEONARD, C.E., KINGSTON.

At this time when there is a renewed interest in Ontario Gold fields, it is of peculiar interest to prospectors and owners of gold locations to be able to arrive at a fair estimate of the value and character of their ores, and of determining on the methods to be adopted for milling or otherwise extracting the value.

The ordinary method of taking hand specimens to an assayer gives results of little value except to indicate whether it is worth while to further explore the property.

A mill test of one or preferably, several tons is of course "the proof of the pudding," and—if properly carried out—gives all information that can be desired about the character and value of the ore sent to the Mill. Queen's College, Kingston, is now happily possessed of a three stamp mill for testing purposes in connection with the new Mining School. This mill will no doubt be of great value to mine owners.

There are, however, many discoveries made in districts so remote from railway or water communication or even from travelled wagon roads, that the cost of sending out a lot of ore for a mill test is so excessive as to cause the owners to hesitate before incurring such an expense.

It is to determine at a reasonable expense at the mine, the gold contents of such ores and the value that can be extracted by amalgamation that the writer proposes the following method which he has used and has checked with the ordinary assays and found very satisfactory.

A quantity of the ore judged sufficient to give a fair average value (say one ton) as broken to egg size on a close board floor (or preferably on an iron sheet) and carefully quartered (sweepings and all). The quarter is again broken smaller and again quartered. The part selected is then coarsely crushed in an iron mortar and sampled. A quantity of the same judged (by size of the shows of gold if any and the supposed value of the ore) sufficient for fair assay is now weighed and ground fine in successive lots in a mortar with water and a *small amount* of mercury until the whole weighed sample has been treated—using the same mercury for each lot. The whole weighed sample is now panned down to separate the amalgam and the concentrates from the tailings. The concentrates are dried and weighed and the *whole of the mercury used* is retorted in a small smooth cast iron retort. When all the mercury has been driven off, the retort is opened and a small quantity of test lead is melted in the bottom of the retort to collect all the particles of gold left from the retorted mercury. The lead is then poured into a mould and the litharge and scrapings of the retort are reduced on charcoal with the blow pipe and the resulting lead added to the first. The lead is now refined and cupelled with the blow pipe in the ordinary way and the resulting button of gold and silver is weighed, parted and weighed again in the usual way.

The dried concentrates (which are much more uniform in value than the free milling ore) can now be assayed by the blow pipe, or a small quantity can be sent to an assayor if the prospector is not sufficiently expert with the blow pipe. If the concentrates are sufficiently rich to be worth saving for further treatment the value can readily be obtained by the blow pipe.

The above method will give you more information and a more accurate assay than a fire assay as usually conducted, because it shows what proportion of the gold can be saved by amalgamation and what value remains in the concentrates, and because it is easy to treat in this way a very much larger sample than is treated in the ordinary assay.

The writer does not propose the above as anything novel—on the contrary it rather reverts to original principles—and some portions of the process will no doubt be familiar to many members of this Institute—still the writer believes there are very few who realize how correct and how valuable is the knowledge of an ore obtained by this method and while he does not propose it as a substitute for a mill test of a large quantity where a mill test is feasible, it is a better assay than any other that he knows of and can be carried out at a trifling cost at the mine with apparatus that a man can very easily carry.

A Recent Trip to the Rainy River Gold Fields.

By Mr. F. HILLE, M.E., Port Arthur.

I have to ask your pardon Gentlemen, for changing the theme of my paper, also for not making this paper as complete as I wished it to be written, on account of my present very limited time, which is also the reason why I could not take the pleasure of reading this paper "in persona," but had to accept the kind offer of my friend, Mr. Burk, to read it for me instead. Indeed, I have to ask your indulgence further, for choosing this subject for my present paper, because you have heard lately so much about the Rainy River District in particular, and about gold in general, that you might consider it too much of a claim laid upon your patience in listening to that theme again and again. Now I shall try to throw as much new light upon this subject, as is at my disposal at present.

Although the Seine River, the principal scene of the present gold excitement in the Rainy River District, is not a new acquaintance of mine from only a week ago when I visited it last. I trusted its waters at different times, in different seasons to carry me to its various borders, but this time, although not the most favorable season for exploration and examination, I looked over some places along its shores, which were partly new to me. The most interesting spot was again the lower, but northerly part of Shoal Lake and Bad Vermillion Lake, not only on account of the frequent occurrence of the precious metal gold, in the veins of the different rocks, but also on account of the geological condition prevailing there. Dr. Lawson in his excellent report on the Rainy River District, dwelt repeatedly on the possible forming of these rocks and in a very sagacious deduction, came to the conclusion that they constituted the products of a highly active volcano of Kewatin age. Undoubtedly they are, and I might add of perhaps "Post" Kewatin age, for the reason that these rocks are massive and compact and that the green schists made up of the tuffs and ashbeds, are seen overlapping the Kewatin highly tilted and foliated slates. These rocks must have been produced therefore in a comparatively quiet period. The granite at Bad Vermillion Lake forms the remainder of the lava in the former vent of the volcano, while the gabbro surrounding the granite its first extravasation. Next overlying the former, as the second ejectamenta, an altered granite (?) called Protogin, and on top of this rock the above mentioned chloritic rock which at the shore of Shoal Lake, is mixed with pebbles and boulders, now called Conglomerates. The protogin forms on Location A.L. 104, the highest point on the north side of Shoal Lake, with the exception of the Graniteboss on the south side of Bad Vermillion Lake, about two miles farther west. Dr. Lawson could not have seen very well the exposure of this rock unless he had penetrated the dense pine forest for half a mile on one side and one and a half miles on the other side from the shore. It is therefore excusable when he thought the green schists formed the contact with the Gabbro, as we can not expect that a Geologist should explore every square foot of the region he is going over.

Allow me, Gentlemen, to dwell a little longer on these rocks and especially on the protogin. The field appearance of the gabbro at the surface is that of a limestone owing to the decomposition of the anorthite, and that of the pretogin as a massive greyish green coarsely crystallized rock, which on unaltered pieces shows by microscopical examination to be composed of much translucent quartz with dark spots as enclosures, some feldspar and a good deal talc or chlorite. If the latter is a metamorphic product after Biotite, the microscope might give us information about it, but I consider this of less importance, than the question "what was the cause, what the agency, that altered this rock, to what it is now?" Pressure? Well, that might have been the primary cause, and formed a favorable condition for the secondary, that is, for a chemical agency. Hot saline waters in a highly eruptive locality suggests itself as the simplest explanation. Now again, the action of such waters on rocks of different kinds was, especially in the latter Archean times, undoubtedly not a rare occurrence; but a rare occurrence must have been the forming of a rock of exactly the same composition, and also rare the happening that all circumstances in altering and changing this rock were found to be the same, acted the same and formed the same results. Because we find this rock in only a few localities, and in this province, yes, I might say on this northern continent, so far as I am aware, only upon a few places in the Rainy River District, and there, following in almost a straight east-north-east line, the water courses of the Seine Atti-Kokan, and appearing as far east as Ossnawee Lake, not in a continuous belt, but in wide intervals, as isolated little knolls. Is it accidently that we have found this rock so far only upon the above named places, because our travels through the country are principally done along the water courses? Or offered our earth's crust at that time especially weak spots, or a weak line in the neighborhood, or along the shore of an Archean Seas, whose beach pebbles and boulders, are found cemented together now, by the lava and ashes, that it was possible to form a group of volcanoes whose ejectamenta are alike! Accepted this has been so, accepted further that the above-mentioned circumstances had prevailed, that hot mineral waters had acted upon the rock then we have to accept also the theory that these waters not only changed this rock, but have been also the agency which have dissolved the minerals out of it, existing therein and infiltered, and deposited them in the fissures of this rock. Wherever we find this protogin here in our western country, the veins have exactly the same appearance, the vein matter is the same, consisting of quartz, blende, copper and iron pyrites and galena, and almost in every instance gold free and combined, and also the sealbend is made up of the chloride or talc of the rock. Now I will not say that lateral secretion was the exclusive cause of the filling of the veins, although it is easier to accept, when one considers that the different minerals appear in vertical lines in the veins, and commence often on both walls with the same mineral, changing towards the middle in equal sequence. I observed another peculiar feature, that is, in the forming of the veins or fissures, they seem to radiate from one common centre which is caused perhaps by the magma being longest hot and viscid there where it was thickest and cooler and contracted therefore more slowly than towards its thinning sides.

Now, when we consider that this protogin is of eruptive origin and comparatively little altered by dynamic forces (perhaps with the exception of a little "rough shaking at times" which might have produced and opened some of the fissures still more) unlike those which prevail in Keewatin times and formed the rocks of that period to what they can be seen now to exist, as often sharply foliated and highly tilted slates, while this protogin still showing its compact and massive structure, then it is to be assumed that most of the veins therein should be of a "true character." If so, and if we consider further the often very rich mineralization of the veins, then, gentlemen, I am somewhat justified to have dwelled upon and kept your attention so long upon the occurrence of this rock, because it will play an important role in our gold mining camps as a rich and permanent producer of that yellow, much desired metal, gold.

To do justice also to the neighbors of this rock, to the slates much developed in the western part of the Rainy Lake and River District, we find in them sometimes very good and very likely also permanent veins, especially where they form the contact between the different series of the Huronian and these and the Laurentian rocks, but a large percentage of the veins in the slates show a bedded, or to use a more current expression, a gashy form. So much is certain that there are few gold-mining camps where the gold is so generally distributed in the numerous veins over so large an area as in the Rainy River District This area extends east to the Shebandowan Lake region and as far known, as far as 50 miles north of the Canadian Pacific Railway from where I received samples of ore last fall identical with those coming from the more southern and western district.

On my recent trip through the Seine River country, I observed the building of several concentrating mills on locations where the veins are neither developed, nor the people have an idea, of what character their ore is or will be, and if the machines bought are suited for it or not. Judging from my experience in testing the different ores over a period of six years, I have to say that a number of these machines are not adapted to our ores here, because they neither work economically nor profitably. Allow me to prove my assertion. As I remakred before, a large percentage of our ores, consist of quartz, blende, copper and iron pyrites and galena, also after taking them out of the workings, out of a certain amount of the country rock chloritic, talcoses and cerisitic in character and further some gold combined and free. The latter usually more so at the surface than farther below where the atmospheric influence ceases, yet in a great number of veins the gold will be found there exclusively combined with the pyrites, and also the other sulphurets greatly increased, therefore the ore will be distinctly refractory. Further we have to consider that there are no reduction works in the immediate neighborhood, the nearest are in Omaha and Newark, that the communications in that country yet, therefore the freight will absorb a large amount of the value of the ores or concentrates.

The machines generally used here are stamps, amalgamating tables and Frue vanners, or vanners of a similar type. Now we know that the stamp is not an ideal grinder, that it produces a large amount of fine muddy slimes, and the more so in disintegrating our ores here. The consequence is that these slimes are settling so tenaciously upon the common amalgamating table and even on the Frue vanners that there is often a great loss of leafy hammered gold particles as well as valuable concentrates. Furthermore, instead of separating the components of the ore, we receive them in our old method mixed together, thereby experiencing not only loss of zinc, lead and copper, by making a present to the smelting works, but also have to pay perhaps an extra cost for treating our high grade zincous concentrates, and increasing our shipping expenses enormously. Because instead of shipping the gold value (let us say from 30 tons of ore) in only one ton to the reduction works, we are sending it in perhaps five or even more tons. Expressed in figures: instead of having $40 shipping expenses we have $200, besides the expense for treatment, loss of the byproducts zinc, lead and copper, and also the expenses for mining and milling. Only a very rich mine can afford such extravagance, but surely not the most of the mines which will be opened in that country. Therefore, I consider it deplorable, that people commence already building mills, before they have a mine and before they know what they have in their mine, because the end result is usually a failure of the individual mine and a condemnation or drawback in the development of a mining camp.

On the other hand in using the right methods in milling our ores, we could make them pay very well, even if the ore is refractory. Yes I might say this refractory ore will pay in many instances, for the expenses in extracting the gold, by saving them and making use of them ourselves.

I said above that there are many bedded veins in that country which show quite an appreciable amount of gold. The nature of these veins would not justify the owners to erect mills for their own use, but it would be possible for them to realize something for their ore, if they could send it to a neighboring custom mill. Such a mill situated at Sturgeon Falls with a splendid water power all the year round, would have a central situation for some time to come, as the trend of the prospectors is eastwards up the Seine. But any individual or company who would build a custom mill there would find out later on he would have made a good investment.

But what a boon would it be for the people being, and going into that country, if the Ontario and Rainy River Railroad were built. Every one of us who has had experience in travelling in winter through this country surely realizes what a good investment a railroad is, but realizes also what a drawback the non-existence of such an institution is, in regard to a rapid development and prosperity of any newly opened region, and especially farming and mining camps. See the existence of the farmers on Rainy River, living on the richest soil that nature can produce, and knowing what treasures they could earn from it if they had a market. The same is the case with the miners, they are sitting on their treasures and don't know how to carry them into the market.

I thank you very much Gentleman for you kind attention.

MISCELLANEOUS.

Fort Steele Mining Association—This is the title of a new organization of mining men in the East Kootenay district, British Columbia. Mr. R. L. Galbraith has been elected president and Mr. Thos. McVittie, secretary. One of the chief objects of the association will be to bring under the notice of the investing public the various mineral opportunities of the Upper Columbia district of East Kootenay, which lie at present generally unutilized from lack of working capital. There are now signs of a renewal of energy in this mining district, to which the formation of the association bears evidence. It remains to be seen whether, as hoped, the efforts of the organization will result in the desired development of the mineral resources, of which, since the Robbie Burns claim jumping litigation, the outer world has really heard but little.

Hamilton Iron and Steel Co.—"A deal is in progress," says the Hamilton *Spectator*, "by which, if the negotiations are successful, the Canadian directors will buy out the American directors and assume entire control of the enterprise. The Canadian directors are J. H. Tilden, John Milne, and J. H. Landon, of this city, and W. Jaffray, of Toronto. The work on the furnaces is suspended at present, pending the completion of the deal, which is expected to be consummated shortly. If it is carried through J. J. Moorehouse will continue to hold the position of superintendent under the new regime, and everything will go on as projected, except that it will become a purely Canadian enterprise.

Kingston Mining School—A summer School of Science will be opened on 10th July, under the auspices of this institution. The object of the school is two-fold: first, to give to public school and other teachers an opportunity of studying the chemistry, mineralogy, geology, botany and zoology of the farm as recommended by the Department of Education; and, secondly, to enable teachers who cannot attend the University during the winter session to prepare for the practical part of the specialists' examination and the University examinations in the subjects mentioned.

An Improvement in Mine Cages—A new mine cage, the invention of Mr. Alexander Gray, is now in operation at the Leiter Mine, Sheridan, Montana. In this cage the chairs are made a portion of the cage, and by a slight pressure of a lever they can be thrown in or out at will. The station tender can never leave the chairs in, as they fly back as soon as the engine takes the load off of them. They can be used, and are very useful, in making repairs to the shaft, such as re-timbering, etc., as they will rest on any set of timbers, and the men employed in the shaft are said to feel safer resting on the chairs than if hanging by a rope.

The North American Graphite and Mining Co. Ltd.—Is applying for Dominion charter of incorporation. The objects of the company will be to acquire by purchase, a tract or tracts of mineral lands in the Province of Quebec and elsewhere in the Dominion of Canada, and to work and develop the resources of the same; to carry on the business of exploring for, mining and gathering graphite, iron, lead, nickel, copper, silver, gold and other metals, minerals and ores in such forms as the same may be found through the Dominion of Canada. The operations of the said company are to be carried on in the Township of Buckingham, in the County of Ottawa, in the Province of Quebec and elsewhere in Canada. The city of Ottawa is to be the chief place of business. Capital stock, $150,000, divided into fifteen thousand shares of $100 each. The names in full, and addresses and calling of each of the applicants are as follows: Nicholas Charles Sparks, of the city of Ottawa, capitalist; Alexander Lumsden, of the same place, contractor; S. Maynard Rogers, insurance agent, of the same place; John Inkerman MacCracken, of the same place, barrister at law; N. Hart White, of the city of New York, wholesale jeweller; Robt. Peel Wakeman, of Southport, in the State of Connecticut, capitalist; and Dwight Spencer Mason, of New York, lawyer.

The Determination of Sulpnur in Pyrites—A reliable method of estimating the quantity of sulphur in pyrites has been discovered by Mr. T. S. Gladding. First, grind the pyrites to an impalpable powder, dry at 100° C., and keep in well-corked bottles. Ten to fifteen minutes' drying is sufficient. Then weigh 1 gramme, introduce into beaker, cover with watch glass, and add 10 cubic centimetres bromine solution, mix by rotating beaker and allow to stand 10 minutes in the cold. Add 10 cubic centimetres nitric acid, mix as before, and allow to stand 10 minutes longer in the cold Finally, place the beaker on a water bath, containing cold water, heat slowly to boiling, and when solution becomes quiet remove glass after rinsing and evaporate to dryness. Add 10 cubic centimetres hydrochloric acid, keeping the beaker covered with a glass, and when violent action ceases, again remove the glass after rinsing, and evaporate to dryness once more. Add 1 cubic centimetre concentrated hydrochloric acid and 50 cubic centimetres hot water, digest until solution is complete, filter, wash with hot water. The filtrate, about 100 cub. centimetres, is now saturated with a slight excess of ammonia allowed to stand hot for 10 minutes. The precipitated ferric hydroxide is filtered and washed five or six times more on the paper with boiling hot water, the filtrate acidulated with hydrochloric acid in slight excess, heated to boiling, and 50 cubic centimetres barium chloride solution added, one drop per second to the boiling liquid. The solution is allowed to stand over night, filtered, washed, and ignited, the precipitate of ferric hydroxide is also dissolved in dilute hot hydrochloric acid heated to boiling, and 10 cubic centimetres barium chloride solution added. It is allowed to stand over night and the barium sulphate thus obtained added to the main precipitates. One filter paper can be used for the two precipitate. The bromine solution is prepared by dissolving 75 cubic centimetres of potassium bromide in 50 cubic centimetres water, adding 50 cubic centimetres bromine, stirring and adding water to 500 cubic centimetres. The bromine will nearly all dissolve. Another form of bromine solution used by some is made by saturating aqua regia with bromine. The first solution is the more certain, however, to oxidise all the ore without separation of any sulphur. The barium chloride is in 10 per cent. solution.

Miners' Changing and Wash Houses in Germany—The following description is given in a German periodical of the accommodation provided for miners at a Saarbrucken colliery: All the buildings are situated close to the shaft, and are so arranged that the miners are only exposed to the outside air for a short time. There is a large waiting room, which communicates on one side with the lamp room, and on the other with a refreshment bar, where coffee and bread can be obtained at moderate prices. Connected with this room is the changing and bath room, 108 by 64 feet, and 16½ feet high. The baths are cells fitted with a warm water douche, and the room contains in all 55 cells, each capable of holding two men. The walls of the cells are made of corrugated iron, and there is a wooden partition in front of the baths, shutting them off from the rest of the room. The room is also fitted with a few cold water douche baths. Between two rows of bath cells a railing is fixed to which ropes passing over pulleys near the ceiling are attached. There is a hook at one end of the rope on which the miner may hang his clothes and then pull them up to the top of the building. Each man has his own particular hook which is numbered. It is found that the clothes dry more quickly when pulled up into the warm air near the ceiling. The water is warmed by steam to a temperature of 95 degs. Fahr., and if the temperature sinks below this, the fact is notfied by the ringing of an automatic electric bell. Each bath requires about 7 gallons of water. The time allowed for the use of a bath for two men is five minutes. The present arrangements allow 1,200 workmen to bathe themselves in one hour. Out of 2,340 workmen 865 used the bath house regularly. The cost of the bath house was £2,144, or £39 per bath or cell. Special mine waggons are used for men meeting with an accident. These waggons are fitted with springs and cushions, and are made so as to go into the cage. The following articles are kept in a house close to the shaft for use in case of an explosion: (1) One small machine ventilator on wheels, and fitted with carrying bands; (2) 100 yards of zinc air pipes, with a few bends, hanging wire, and cloth for plugging holes; (3) rolls of brattice cloth; (4) saws, picks, hammers and nails; (5) three small hand ventilators; (6) 100 yards of small pipe for the hand ventilators; (7) water bottles and straps; (8) vinegar for filling the water bottles; (9) note books and pencils; (10) torch lamps for surface ligthing; (11) small pipes, screws, tools, etc., for ventilating and pumping requirements; (12) a portable fire engine with hose.

THE DOMINION WIRE ROPE COMPANY, LTD.

MONTREAL

Manufacturers of 'LANG'S PATENT WIRE ROPE.

FOR

TRANSMISSION AND COLLIERY PURPOSES.

SOLE CANADIAN AGENTS for the

JEFFREY

STEEL CABLE CONVEYORS

FOR

Handling Coal, Ores, Minerals, Refuse, Etc.

SOLE CANADIAN AGENTS for the

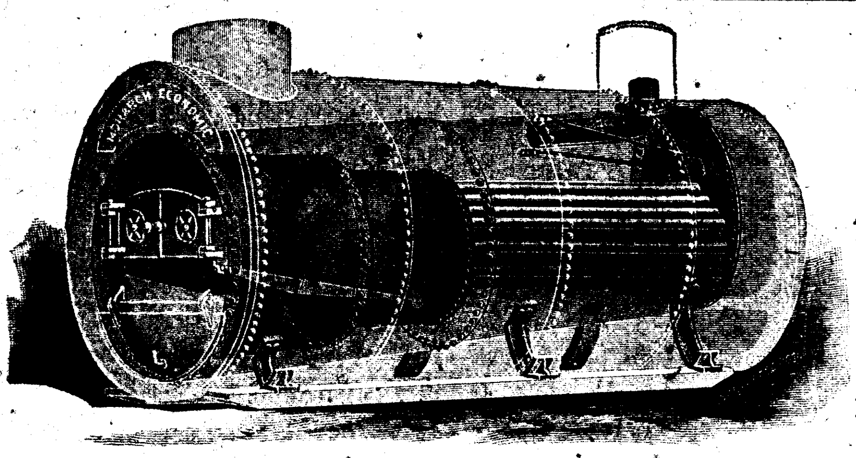
CELEBRATED

"BLEICHERT"

TRAMWAYS.

Also Ropes for Hoisting, Mining, Elevators, Ship's Rigging and Guys, Etc., Etc.

Send for Catalogue and Estimates to P.O. Box 1942



MONARCH ECONOMIC BOILERS

REQUIRE NO BRICKWORK

And are guaranteed to save 10 per cent. in fuel over any brickset boiler; in some cases the saving has been as high as 30 per cent.

We also build Lancashire and the ordinary Brickset Boilers, or any other usual type.

ROBB ENGINEERING COMPANY, LTD. ✳ AMHERST, NOVA SCOTIA.

Dominion Coal Company, Limited.

Owners of the Victoria, International, Caledonia Reserve, Gowrie, Little Glace Bay, Bridgeport and Gardner Collieries.

OFFERS FOR SALE

STEAM, GAS and DOMESTIC COALS of HIGHEST QUALITY

Carefully prepared for Market by improved appliances, either F.O.B. or Delivered.

It is also prepared to enter into Contracts with Consumers covering a term of years. Its facilities for supplying Bunker Coals with promptness is unequalled.

APPLICATION FOR PRICES, ETC TO BE MADE TO

J. S. McLENNAN, Treasurer, 95 Milk St., BOSTON, MASS.

DAVID McKEEN, Resident Manager, Glace Bay, Cape Breton.

M. R. MORROW, 50 Bedford Row, Halifax.

KINGMAN BROWN & CO., Custom House Square, Montreal.

HARVEY & OUTERBRIDGE, Produce Exchange Building, New York, Sole Agents for New York and for Export.