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.

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 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:

- ☐ 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

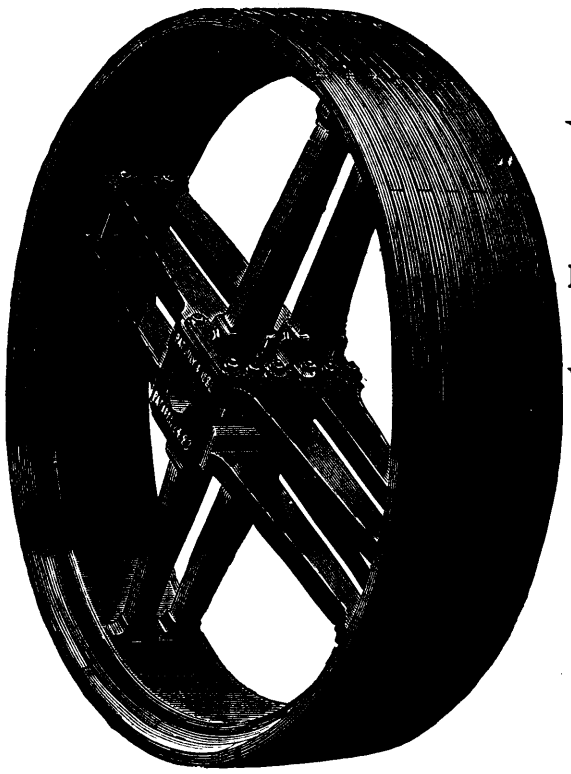
This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

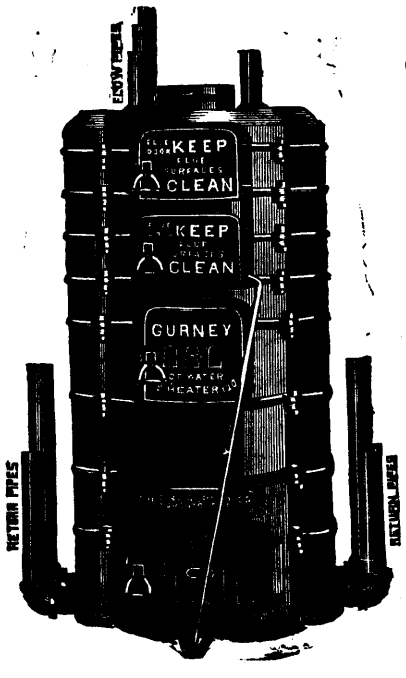
10X	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X
										✓	

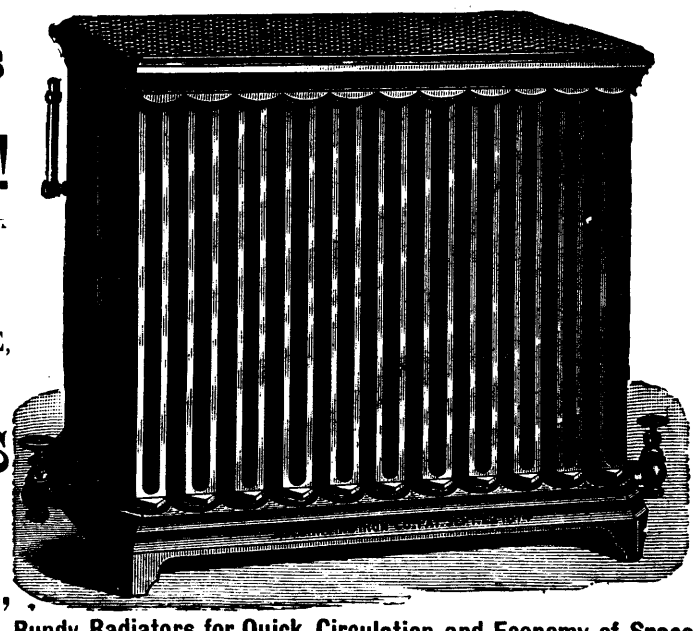
The Canadian MINING REVIEW

Established 1882

Vol IX.—No. 5. 1890.—OTTAWA, MAY—1890. Vol. IX.—No. 5







Geological and Natural History Survey of Canada.

ANNUAL REPORT, 1887-88.

VOL. III. PARTS I and II.

With Accompanying Geological Maps, Plans of Mine Workings, and other Illustrations; also a Complete Alphabetical Index.

NOW PUBLISHED AND ON SALE.

Price, Complete, Two Dollars.

The Report includes thirteen separate Reports, as follows:—

(*a.*) Summary Report of the Operations of the Survey for 1887-88. Single copy, 10 cents.

(*b.*) Report of an Exploration in the Yukon District, N. W.T., and Adjacent Northern Portion of British Columbia (with maps, etc.), by Dr. G. M. Dawson, D.S., F.G.S. Single copy, 30 cents.

(*c.*) Geology of the Mining District of Cariboo, B.C., (with maps), by Amos Bowman, M.E. Single copy, 25 cents.

(*e.*) Notes to Accompany a Preliminary Map of the Duck and Riding Mountains, N.W.T., (with maps), by J. B. Tyrell, B.A., F.G.S. Single copy, 10 cents.

(*f.* The Geology of the Rainy Lake Region (with map), by Dr. A. C. Lawson. Single copy, 25 cents.

(*h.*) Mines and Mining on Lake Superior (with maps, plans, drawings, etc.), by E. D. Ingall, M.E. Single copy, 30 cents.

j.) Explorations in James' Bay and Country East of Hudson Bay, by A. P. Low, B. Ap. Sc. Single copy, 25 cents.

(*k.*) Second Report on the Geology of a Portion of the Province of Quebec (with map of the asbestus mining region), by Dr. R. W. Ells, F.G.S.A. Single copy, 25 cents.

m.) Explorations and Surveys in Northern New Brunswick and Adjacent Areas in Quebec and Maine, U.S.A., (with map), by Dr. L. W. Bailey and W. McInnes, B.A., F.G.S.A. Single copy, 25 cents.

(*n.*) Surface Geology of North-Eastern New Brunswick, etc., (with maps), by R. Chalmers. Single copy, 20 cents.

(*r.*) The Mineral Wealth of British Columbia, by Dr. G. M. Dawson, D.S., F.G.S. Single copy, 25 cents.

s.) Statistical Report of the Production, Value, Exports and Imports of Minerals in Canada, by E. Coste, E.M. Single copy, 25 cents.

t.) Chemical Contributions to the Geology of Canada from the Laboratory of the Survey, by G. C. Hoffman, F. Inst. Chem., F.R.S.C.

Note.—These and all other Publications of the Survey may be purchased from or ordered through

W. FOSTER BROWN & Co., Montreal,
DURIE & SON, Ottawa, Ont.,
WILLIAMSON & Co., Toronto, Ont.,
MCGREGOR & KNIGHT, Halifax, N.S.,
J. A. MCMILLAN, St. John, N.B.,
J. N. HIBBEN & Co., Victoria, B.C.,
R. D. RICHARDSON, Winnipeg, Man.,
MOIR & MILLS, Port Arthur, Ont.,
THOMPSON BROS., Calgary, Alta.,
EDWARD STANFORD, 26 and 27 Cockspur Street, Charing Cross, London,
SAMPSON, LOW & Co., 188 Fleet Street, London,
F. A. BROCKHAUS, Leipzic,
B. WESTERMANN & Co., 838 Broadway, N.Y.,

or by application to

DR. JOHN THORBURN,
Librarian,
Geological and Nat. Hist. Survey, Ottawa.

The Canadian Mining Review

CONDUCTED BY . . . B. T. A. BELL

OFFICES:

UNION CHAMBERS, 14 METCALFE ST.,

OTTAWA.

Vol. IX. MAY, 1890. No. 5.

WANTED.

Any of our readers having spare copies of January, February and March issues of the Review for this year, will confer a favor by returning them to this office.

Mining Legislation in Nova Scotia.

During the session of the local parliament just closed, several enactments were passed of a character to interest the miners. No State or Province on this side of the Atlantic has paid as much attention to the education of the coal miners as Nova Scotia. The limited resources available for this purpose have been carefully expended. This year the Board of Examiners for candidates for certificates as underground managers has been re-organised. It is to consist of the Chief Inspector and nine persons conversant with coal mining, three Mining Engineers, three Colliery Managers and three Colliers. The Province is divided into three Districts for examination purposes. The papers of the candidates are forwarded for a general meeting of the Board when the proper certificates are granted. There are at present in the different mining localities, nine instructors engaged in preparing candidates for the examinations. There is no fee paid by the pupils. The rooms, light, etc., are furnished by the Government, and the instructors are paid a fee for each candidate passing successfully.

The course of instruction comprises surveying, ventilation, mine management, methods of working, etc., and no restriction is placed on the attendance of young men who are under age, but are anxious to improve themselves in the higher walks of their calling. These schools of instruction are peripatetic so that in rotation they visit every locality where pupils may offer.

It was to be expected that in the case of coal miners, who are obliged to work at an early age, there would be many who were qualified by experience although deficient in familiarity with the rudiments of scholarship, and the principles under-lying the practice of mining. As this became apparent from the reports of the Board of Examiners and the Instructors, a further step was decided on, and during the session of this year, legislation was passed to the following effect :—

First.—That in any community where there are twenty-five or more persons of the age of fifteen years and upwards, wishing instruction in the ordinary branches of an English education, night schools may be established for their benefit.

Second.—That the Council of Public Instruction shall provide licensed teachers who shall be paid such salaries as are deemed adequate.

This legislation, although couched in general terms, applies more especially to those communities where the younger members are obliged to work at an early age, and are deprived of the educational facilities extended to their more fortunate brothers. And by its means it is hoped that cities, industrial and mining localities will be benefitted.

The Coal Mines Arbitration Act passed last session, having proved on trial to be in some important respects couched in ambiguous language has been repealed, and re-enacted. The principle remains substantially as before, that a majority of the employed must be desirous of arbitration before its provisions can be put in force. That a preliminary hearing must be had before the Commissioner of Mines who is to decide if there be *prima facie* evidence warranting a reference to the tribunal of arbitration or not. The Board of Arbitration consists of five persons, two permanent members appointed by the Government, one from the employers, one from the employed, and a fifth appointed jointly by the last two. The Act contains provisions for retention of wages, and for a deposit of an equivalent amount by the employer pending a decision of the Board. Proceedings under the Act cannot be removed by *certiorari* or otherwise into any court of record, and an appeal lies only to the Supreme Court in *banco*. The provisious of the Act appear to be drawn in favor of the employed, but presumably the great difficulty will be found in any attempt of the Board to decide what constitutes a financial condition of any company to warrant either an increase or lessening of wages when the rates paid are about the average.

During the passage of the bill through the local legislature, a measure having the same object in view was introduced in the Imperial Parliament, but its chances of passing are considered doubtful.

The gold mining areas in Nova Scotia are composed of multiples of areas 250 by 150 feet, and as errors are sometimes committed by surveyors, which give rise to disputes, and loss of mining ground, it has been sought to regulate this by requiring the adjoining lessees to be present in person or by agent during any survey ordered by the department. If no objection is raised when the representatives of all interested properties are present at the survey, the lines then laid down are to be taken as fixed. If any are absent through unavoidable cause, the survey can be repeated on the applicant, one of the interested parties, depositing with the commissioner a sum equal to the cost of the first survey. Should the check survey prove the correctness of the first survey, the applicant loses his deposit, but if the first survey proves incorrect, the expense of the second survey is borne by the department and the applicants deposit refunded.

As the farmers living on the outcrops of coal seams have been in the habit of sinking small pits secretly, inside barns, in cellars, etc., and of extracting coal for their own use and for sale, considerable trouble has been caused to legitimate mines. These workings have frequently broken through the barrens of coal left by the lessees at the outcrops of their seams, and have deranged ventilation, admitted surface water, and caused damage by fire. To meet this state of affairs, power is given to the inspectors to enter any premises, and if such openings are found, the amateur farmer-miners are liable to a fine, are bound to fill up their pits, and make good all damages.

Hitherto, although adequate fines awaited the man caught selling coal unlawfully mined, it was as a rule impossible to identify the coal, and there was no provision for searching premises unless under definite information. It is to be hoped that these measures will be found sufficient to put an end to this surreptitious mining, which might at any moment cause the loss of a valuable colliery.

Royalties on Railway Lands in British Columbia.

With a view to promoting the construction of railways, the Local Legislature of the Province of British Columbia has enacted, during its last session, that any such new companies shall have the right to levy a royalty not exceeding 5 per cent on all gold and silver that may hereafter be discovered on the lands granted to them. In introducing the measure, the Premier stated that the granting of a royalty on the precious metals was an entirely new departure. He reminded the House that in the early history of the province there was an export tax levied of fifty cents an ounce on all gold taken out of the mines as a consideration for the heavy expenditure by the Government in the construction of roads. "That tax," he said, "although not an unjust one, proved to be extremely unpopular, and was ultimately abandoned." And so we venture to predict will also be the present measure. Everyone will agree with Mr. Robson that it is of the greatest importance to the development of the Province that railways should be constructed to make its rich mineral areas accessible, and if it is necessary in order to effect this to offer some inducements to companies or individuals, the Government must do its best to further and promote so desirable an end. Only on this ground can a land grant be justified, and even then the concession should be fenced round with every possible safeguard to prevent the gift being used for speculative purposes. In Germany, Great Britain, and most European countries, and also in our own Province of Nova Scotia, the minerals are rightly regarded as belonging to the Crown, and a large

yearly revenue is derived therefrom. In this way the development of our mines proves directly beneficial to the country. But to grant monopolies to companies or individuals in the manner indicated by the Hon. Mr. Robson's measure will surely prove hurtful and injurious. It places a burdensome premium on the work of the explorer and the prospector. As the *News-Advertiser* very well points out :—"The management of a railway company has got to do the best it can for its shareholders, and if the miner, after discovering a vein of the precious metal, cannot work it at a profit, taking the payment of the royalty into account, what follows? Simply that the owner of the royalty, the railway company, steps in and gets possesion of the claim, and, being itself free from any burden of a royalty, can make a profitable undertaking of it. There is also every probability that the railway company will transfer these royalties to another or a secondary company, whose business it would be to develop and control these land and mineral properties —an eminently practical and proper arrangement from the railway company's point of view. With such a middleman the condition of the miner would be still worse and an incubus would be saddled upon our mining industry which would, within a short time, create a feeling similar to that which two years ago caused such an agitation throughout Manitoba and the North-West, over the 'monopoly clause' in the Canadian Pacific Railway Charter."

Again, as our contemporary contends, the rate of the royalty is excessive and burdensome. "It will result in the smelting company charging the miner the usual prices for the treatment of the ore, with five per cent. additional on the value of the gold and silver to cover the royalty which it will have to pay over to the railway company. A smelting company, with a capital of $100,000 sunk in plant and machinery, can, if operated properly, turn out in the course of a year base bullion of the value of $1,000,000 for the gold and silver it contains, besides that of the copper, lead, or other inferior metals. Now the royalty of 5 per cent. on this would be $50,000, or exactly 50 per cent. on the capital of the smelter, instead of the one-half of one per cent. on the same that the hon. gentleman figured by his method. If he will take the trouble to enquire what have been the results of the operations of the smelting companies at Leadville, Pueblo and Denver for the last ten years, he will find that the imposition of a tax on them which would have amounted, during that period, to the enormous sum of $20,000,000, would have compelled them to suspend operations."

Meetings have been called and a vigorous protest will be made by the miners against the imposition of any such scheme as that submitted by the Hon. Mr. Robson.

An important meeting of the Gold Miners' Association of Nova Scotia will be held in the Halifax Hotel, at three o'clock in the afternoon of 3rd prox. Business of considerable interest to the Association will be discussed, and every member should make it a point to be present.

Instructions on the Immediate Remedies to be Applied in Cases of Accidents.*

Asphyxia.

Asphyxia is a state of apparent or real death caused by the stoppage of respiration.

Any cause which prevents a sufficient quantity of air from reaching the lungs may cause asphyxia. Such is drowning, strangulation, the compression of the chest (by something falling, for instance), the existence in the air of unbreathable gas, etc.

The first duty to fulfil in case of asphyxia is to remove the victim from the cause which occasioned the accident. We will not dwell upon the manner of drawing out a drowning man from the water, or upon the necessity of immediately loosening the rope from around the neck of a man hanging, etc. A few words are necessary on the precautions to be taken by the preserver in case of asphyxia from unbreathable gas, to prevent his being struck down himself.

He should commence by making an opening from without if possible, by means of ladders and poles, breaking the windows where the accident occurred so as to renew the air before going in.

If this cannot be done, he should put over his nose and mouth a cloth saturated with vinegar and water, and should pass around his body a strong rope, which will enable him to be pulled out should he lose consciousness.

Before going into the place he should draw a long breath and try and hold his breath until he should have opened all the apertures so as to let in the pure air. In certain cases where sufficient air cannot easily be let in (as in cellars, etc.), he should also carry a rope, the end of which is held outside and on the other end of which is a noose which he should attach to the victim's clothes, and that being done, he should quickly retire while the assistants will draw out the asphyxiated person. (If the gas that has caused the accident arises from the combustion of coal or pit coal, it would be useful before entering the room to throw in large quantities of water mixed with slack lime.)

In a case where the accident is caused by illuminating gas, he must take great care not to enter the room with a light, that might ignite the gas and cause an explosion.

Immediate help.—The man is then carried into a well-ventilated room, moderately warm, and should have around him only those absolutely required. As a general rule, in cases of asphyxia as well as for all other accidents, if it be a women, the assistance should be given, if possible, by other women, and the curious should be strictly prohibited from entering. The victim should be undressed quickly, or if this be difficult the clothes should be cut with scissors. He should then be placed on a bed, or on a simple mattrass placed on a table, after having placed a bolster under the shoulders to raise the body slightly, the head falling backwards. He is then covered with a light covering, and for want of better, with straw or dry hay. These preliminaries having been quickly done, the mouth of the asphyxiated is opened and a small piece of wood is placed between the teeth, or a handle of a spoon or some other flat object, not sharp, is inserted; the jaws are kept apart by placing a cork between the large teeth, and the tongue is drawn out with the fingers which are covered with a handkerchief or a cloth. With the finger or with the feathered end of a feather, the nostrils, mouth and throat are cleared from mucus and froth that obstruct them.

All this is done quickly but methodically, while the assistants try to restore warmth and the circulation by dry rubbing, with hot bricks and irons and with hot smoothing irons wrapped in flannel and passed over the body. Rubbing with spirits with a flannel, a rough towel or a handful of straw is useful.

A lighted match should frequently be placed to the nostrils and a cork still wet with alcohol whose sharp penetrating vapour produces salutary irritation.

If, notwithstanding these manœuvres, the body still remains inert, and the respiration does not return, artificial respiration must be resorted to without too much delay.

Artificial Respiration by the Sylvester process: This process consists in producing, by movements of the arms, the play of the muscles that raise and lower the chest.

The operator places himself at the head of the asphyxiated who is lying on his back and raises his shoulders with a blanket or an article of clothing rolled up. The feet are supported and held by an assistant so that the body remains immovable.

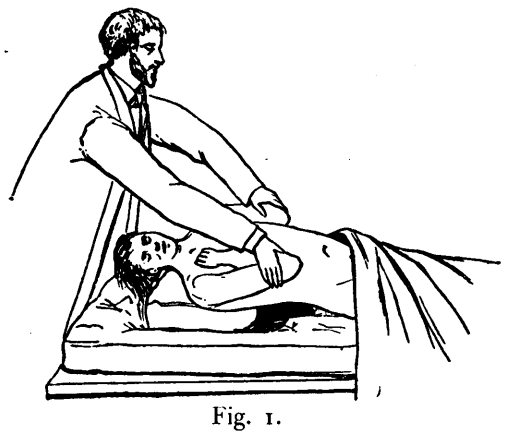


Fig. 1.

It is needless to say that all the preceding precautions which have been described should have been taken, that the nose and the mouth should have been cleaned and that the tongue has been drawn out. In case of need, it is kept in this position by passing a handkerchief under the chin in such a manner that it is pressed between the teeth.

The operator then places himself at the head, he grasps the arms of the asphyxiated close to the elbows, the forearm being bent on to the

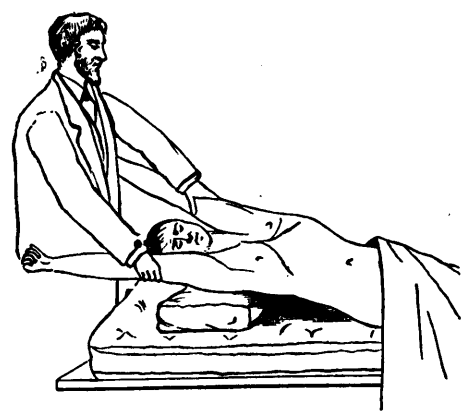


Fig. 2.

arm (Fig. 1), and having pressed them rather tightly on the sides of the chest, he then raises them quickly but without violence over the head, making them describe the arc of a circle (Fig. 2). He then brings them back to the first position and recommences the manœuvre, imitating the beats of normal respiration. The operator ceases

*Summary Extract of Chapters II and III of the work by Messrs. E. Ferrand & A. Delpeach, at Messrs. J. B. Baillière et Fils, 19 Rue Hautefeuille, in Paris.

after a few movements in order to judge the effect he has produced, and begins again if the respiration is not established of itself.

During these manœuvres the assistants continue rubbing under the covering or over the dry clothing; they renew the application of hot flannels, or bottles of hot water, or of hot bricks placed along the body, to the feet, or under the armpits.

As soon as there are signs of life we give the sick person a few spoonsful of cordial, hot wine, grog, &c. If there be nausea we aid the vomiting by passing over the uvula an oiled feather.

Then we place the sick person in a warm bed, his head being slightly raised, and care should be taken to allow air to circulate well around him. It will not be long before he will fall asleep, but his sleep should be watched in case new symptoms of asphyxia should manifest themselves. We have seen persons asphyxiated return to life after a very long period (several hours); therefore we must, so long as any hope remains, continue to practice the artificial respiration, changing the operator so as to prevent fatigue.

Here are some of the signs by which we may know that all hope is gone:

If, on applying the ear to the chest in the region of the heart, we hear no beating; if a glass placed at a short distance from the mouth be not tarnished; if a hot coal, placed at the end of the toes, produces no sign of feeling or no blister.

Loss of Consciousness.

The loss of consciousness is due to various causes. Besides those we have already described as being caused by asphyxia, we will mention among the most ordinary cases: concussion of the brain (see farther on), overcome by heat, apoplexy, epilepsy (or *haut mal*), syncope. (We call syncope the state of a person who is ill either on account of emotion, weakness, loss of blood, etc.)

Immediate help.—Send away the curious; loosen the collar and belt; give as much air as possible.

If the face is pale (syncope) lay the sick person down flat, the head low, throw a few drops of cold water on his face, make him inhale vinegar, ammonia or ether, and rub the temples and forehead with vinegar and water, eau de cologne, etc.

If the face is highly colored (congestion, apoplexy) place the sick person on a bed, the head high and the legs hanging, and place on the head cloths dipped in cold or ice water. If there be vomiting, turn the head on one side to prevent the matter from being breathed into the lungs.

In case of epilepsy (which we distinguish by convulsions which accompany the loss of consciousness) all the cure consists in securing the sick person from the violence of the shock and the fall; put in the tongue, which might be caught between his teeth and bitten. We must then wait patiently until the workings cease of themselves.

Bruises.

CONTUSIONS.—They are the result of a violent shock against some body that will not yield (such as blows, falls, &c.) and are characterized by pain and swelling of the part affected, the skin remaining intact. A violent contusion without any of the vital organs being injured brings on syncope. (See what is to be done in such case.) Finally the contusion of some important internal organ, such as the brain, the lungs, may entail the most serious consequences and cause, according to the organ injured, the loss of consciousness, spitting of blood, &c.

Immediate help.—In cases of slight contusions apply wrung out cloths dipped in cold water or *eau blanche*. If the accident is more serious, carry the wounded person into a well-ventilated room, put him on a bed or mattrass and be careful to remove everything that can interfere with his breathing. And while awaiting the doctor, keep, on the part injured, compresses of ice water, and renew these frequently.

WOUNDS.—Wounds are of differents kinds according to their causes, such as a piercing, a shock, an incision, a tearing; their gravity depends on their extent, their depth and above the particular organs injured, such as blood vessels. lungs, heart, etc.

Immediate help.—Take scrupulous care not to touch the wound with dirty fingers, dirty cloths, sponges, and cover them with lint or cob-webs, &c.; all manœuvres that might introduce into the wound bad germs might be the cause of poisoning, and consequent blood poisoning and death. Clear the wound from anything that may soil it (such as sand, earth, &c.) by washing it thoroughly with pure water and better still with phenic water, and with the aid, if required, of a clean piece of linen such as a napkin, a handkerchief, &c.

While waiting for the doctor you should never permit any one to remove anything that has penetrated into the wound and which offers any resistance to a slight pull, we should not pull off either the pieces of skin adhering or the clots of blood which the water could not remove.

Cover the wound with a compress cold water, or, better still, phenic water, and keep it in its place by a napkin or linen band.

HEMORRHAGE.—Hemorrhage or loss of blood, which accompanies every wound, may assume such proportions as to necessitate immediate remedy.

Immediate help.—When the blood is thick, of a dark red color and flows gently and not by starts, it is generally sufficient after having removed everything from the wounded part that could interfere with the circulation, such as clothes, garters, etc., to press on the wound with the aid of the fingers or by means of a piece of linen moderately light.

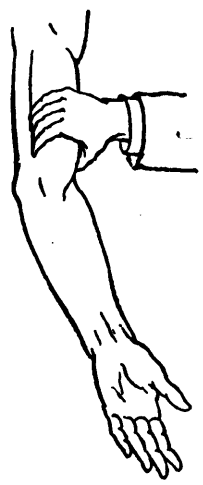


Fig. 3.

This process is insufficient in the greater number of cases where a small artery is injured. In each case vermillion red blood flows from the wound by starts correspondiug with the beatings of the heart, and death is imminent unless the hemorrhage is stopped. Compression of the principal artery of the limb, while awaiting medical aid is always the surest means of saving the life of the wounded.

It is important to know the places where this operation can be more easily performed and consequently with more chance of success.

We will now enumerate them.

For a wound in the forearm or the hand seek the artery above the elbow in the inside of the arm besides the biceps muscle. (Fig. 3.)

Fig. 4.

For the lower limbs in the middle and a little above the fold in the thigh. (Fig. 4.)

For a wound in the head, seek the artery (carotide) near the middle of the neck on the front side of the principal muscle, which, from behind the ear, extends to nearly the middle of the chest and press it from the front to the back of the vertebra of the neck. (Fig. 5.)

Fig. 5.

The cessation of the hemorrhage will indicate that we have found what we sought.

If we do not succeed in stopping the blood in this way we must try and produce with compression by means of elastic bands (such as suspenders, etc.) bound round the injured limb above the wound. Should it be required, we should use a cloth folded like a cravat, the ends of

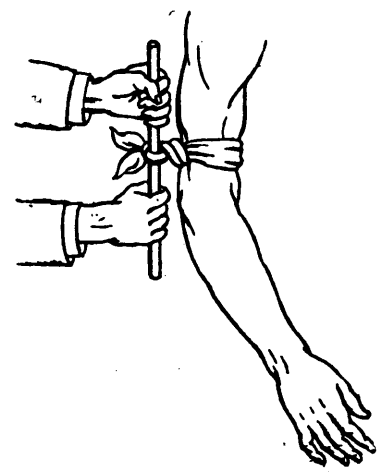


Fig. 6.

which we fasten in a knot and under which knot we pass a piece of wood (a cane, etc.), sufficiently long that by turning it we succeed to tighten the cloth and compress tightly the limb. (Fig. 6 and 7).

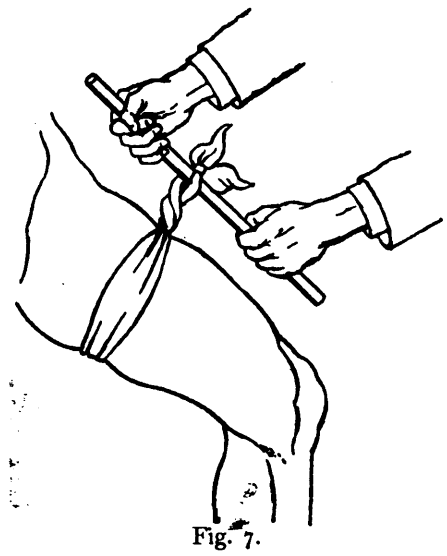


Fig. 7.

WRENCH (SPRAINS)—*Immediate help.*—Apply fresh water in the form of a bath, running water, or compresses frequently renewed.

DISLOCATIONS.—There is dislocation everytime that the extremity of a bone comes out of its natural cavity to take a wrong position. We are notified of the dislocation by the characteristic malformation of the place when compared with the symmetrical one, by the change in the length of the limb and by the inability of the injured person to perform certain movements. These dislocations are caused by falls, violent movements made in abnormal positions, sometimes by blows.

Immediate help.—It would be dangerous to attempt the work of replacement, which to be of any use would require accurate anatomical skill. We must then content ourselves by the exercise of palliative measures that will soothe the patient and stop the swelling of the part, until such time as the doctor arrives.

We must simply apply compresses of (eau blanche) sugar of lead water and keep the sick person lying down in the least fatiguing position possible.

FRACTURES.—The immediate symptoms of a fracture are the impossibility or difficulty of

Fig. 8.

moving the injured limb, the change more or less great from its natural position, and the rubbing of the two ends of the broken bones. We may notice also in the parts that are held together by a single bone, such as the arm, an unnatural bend, and the individual movements of the two parts which form the bone.

Immediate help.—We must avoid all protracted attempts to assume ourselves that there is really a fracture and apply the remedy indicated as if we were positively certain. The first thing to be done is as simple as possible, and is intended to keep the limb immovable in its normal position. It is formed of small pieces of wood (splints) which are cut the necessary length and thickness, and pieces of thick cardboard. While these are being prepared the injured limb should be covered with a compress dipped in cold (eau blanche) sugar of lead water. Then the splints covered with wadding or a soft thick cloth, are put around the limb and then fixed with bands or several handkerchiefs.

The figures 8, 9, 10, 11 and 12 render it unnecessary for us to enter into further details.

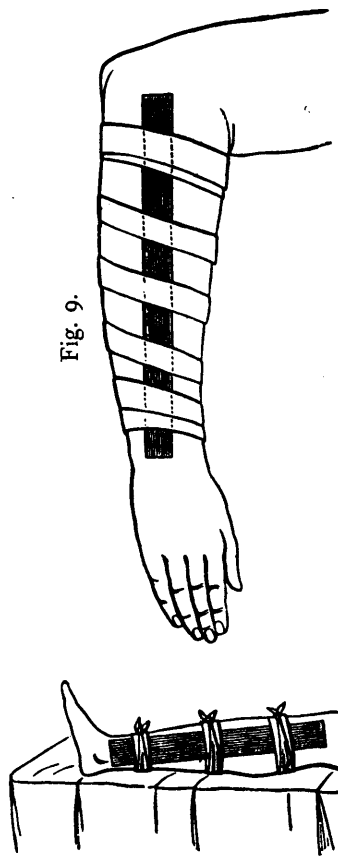


Fig. 9.

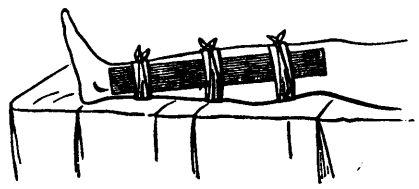


Fig. 10.

Fig. 11.

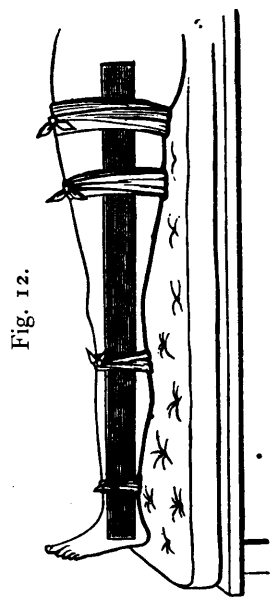


Fig. 12.

When the fracture is rendered worse by wounds, we must commence by attending to these as has been indicated; and after having covered the wounds with compresses, we apply the provisional remedy.

The doctor should be called within the shortest delay. He alone is authorized to make a thorough examination of the injured limb, to unite the fracture and apply the final application. To wait too long entails much trouble; the painful swelling of the muscles next the fracture is an obstacle to the putting on of the bandage, which delays and interferes with the cure.

In case of a fracture of the arms, the injured person should, if his strength is sufficient, seek his own dwelling or that of the doctor, that is if the distance to travel is not too great. See on Fig. 11 the position of the sling used to support the arm.

If the fracture be in the lower limbs the patient should not in any case be allowed to walk.

To carry the wounded we must use a stretcher or upon something made to resemble it.

A plank, a shutter or a door can be used; it should be covered with a straw bed or dry grass, and care should be taken, by some means or other, to keep the head raised.

BURNS.—*Immediate Help*—When a person's clothes are on fire the first thing to do is to smother the flames by whatever means may be at hand; you should at once cover them with a cloak, a blanket, a quilt, a carpet, &c., and wrap it closely around him. The fire being extinguished, we should relieve him of his clothes, using scissors if necessary, so as to prevent the rubbing which might pull away the flesh and cause intense suffering. If pieces of the cloth remain stuck to the flesh it is better to leave them than to try and remove them.

Open the blister by a prick from the extreme point of a pin; but take great care to protect the skin that covers the sore and prevent direct contact with the air. Apply on the burned parts a linament which is obtained by shaking in a corked bottle a mixture in equal parts of oil and lime, or if this cannot be obtained, use olive oil, butter or any other grease spread on cotton.

When the burns are caused by *chemical caustics*, we should be careful not to use water in the first instance; it would only excite the corrosive action, causing intense suffering; we must try, on the contrary, to extract what remains of the caustic by touching it gently with wadding or lint, until the drying up of the sore, and then only should there be frequent washing with

alkaline water (a solution of carbonate of soda, etc.), soap suds, lime water. If the burn is caused by acids, then wash with vinegar water; if by burns from potash or soda, ammonia or quick lime is used.

FOREIGN BODIES INTRODUCED INTO NATURAL CAVITIES.—If a foreign body has penetrated the eye, the nose or the ears, and if it cannot be pulled out very easily, we should await the arrival of the doctor.

When a foreign body has entered the throat which, leaving aside the inconvenience and discomfort, might cause suffocation and even asphyxia, we should try and remove it with the aid of the finger.

If this means is not successful, we must try and drive it down by making the patient swallow small balls of bread crumbs, or pieces of cooked potatoes, as large as possible. If there be suffocation, try and make the patient vomit, by making him drink warm water or by tickling the palate.

POISONING.—*Immediate help.*—While waiting for the doctor, for whom we must send quickly, try and remove the poison as quick as possible, by causing vomiting. For that purpose, make him drink large quantities of lukewarm water, tickle the throat with the finger or a feather.

Give him, moreover, emollient and softening drinks, such as milk (which should be given in the first place) and albumen water (which is made by beating the whites of four eggs in a pint of water) gum water, etc.

If it is known what poisons have to be dealt with, the following substances may be given:—

In poisoning with *acids* (sulphuric acid, or vitrol, nitric, etc.) carbonate of soda, pounded chalk, magnesia, etc., dissolved or soaked in a good deal of water is used.

In poisoning with *alkalies* (caustic soda or potash, etc.) water slightly flavored with vinegar or acidulated milk with the juice of lemon is used.

With *arsenic*, magnesia mixed with water.

With *salts of mercury* (corrosive sublimate, etc.) the white of an egg.

With *phosphorons*, magnesia and over and above, ten drops of the essence of turpentine in milk every half hour.

Avoid oil and fatty substances.

Finally, if we have to deal with *vegetable poisons* (such as opium, belladonna, etc.) administer strong black coffee and spirits, and apply compresses of cold water to the head.

CONTENTS OF AN AID BOX.

Bottle of ammonia (volatile alkali).
do spirits of camphor.
do extract sugar of lead.

To prepare (*eau blanche*) mix 2 tablespoonfuls of extract of sugar of lead in a pint of water.

Bottle of 100 grammes of high wines and phenic acid at 90 per cent.

To prepare phenic water (*l'eau pheniquée*), mix 2 tablespoonfuls of that solution in a pint of water, and shake the mixture so as to dissolve all the phenic acid, which commences by separating in the form of oily drops.

Bottle of vinegar.
do oil of almonds.
do lime water.

An empty bottle to prepare the calcareous liniment.

Bottle of *eau de melisse.*
do hydrate of magnesia.

A few linen hands; a few rolls of lint for dressing.

A few splinters of wood (splints) for fractures.

The Belgian Collier's System of Benefit Organization.

The Mariemont and Bascoup Coal Companies employ over 6,000 persons of the working class.

In the work of mining the system of sale and that of premiums have been in use for the last fourteen years and have proved eminently satisfactory to the interest of both master and workman.

Sales.—Certain kinds of work with mines, the condition of which rarely change, may be put up to auction. Herein the workman finds many advantages, a settled price for his work during a certain period of time agreed upon, the security it gives him, the power of choosing as partners in his work, workmen of the same ability as himself, and the chance of his wages increasing in proportion to the work done, provided work is regular and favorable, &c.

Bargains.—The care of the underground ways, the different repairs to be made and especially the cutting of coal are all subjects of bargaining; that is the price discussed between the engineers or their assistants and the workmen.

Premiums.—Since the system of premiums has been introduced for all workmen loading, driving or drawing the coal from the pits, their wages now consist of one fixed part, and of one proportionate part in accordance with the number of cars that have passed through their hands, or with the quantity of coal taken from the pits. This system is a real stimulus for the workmen, and a certainty for the owner, of coal being mined with regularity.

Contracts.—In dealing out the material from their repair shops, stores, &c., the organization of work by the job has been extended to all workmen without distinction, although in certain classes of work, such as drawing up coal and repairs, difficulties are incontestably met with. Its results are an increase of wages of 20 per cent. with a proportionate decrease in the price of returns. The greater part of the yearly work such as the driving of machines, the repair and the care of the material are all contracted for, the contracts not extending over a year. They are signed by the coal companies and the bands of workmen who accept them. The amount for which they are accepted is frequently based on the quantity of coal extracted. All the risks of the work, which very often varies in quantity, are accepted by the workmen. Past experience shows that, though the coal company may at times advance money, and at others the workmen may advance work, in the end the compensation is about equalized. Besides, the profits made by the contractors show that the confidence in the results was not misplaced They have, in fact, signed new contracts under conditions entailing reductions of 20, 30 and even forty per cent. in favor of the companies. If, therefore, their wages have not diminished it must be because they have worked harder, or they have improved their manner of working, making it more intelligent and have thus seconded the efforts made by their superiors in providing improved implements.

Colorado's Mineral Palace.—Tne mineral palace now being erected at Pueblo, Col., will cost about $250,000. It will be of handsome design, the exterior being a series of square columns and beautifully polished stone. The carving will be ornate. All parts of the building will be made of the products of Colorado's mines, the owners in all the counties in the State having sent in their choicest and richest specimens. In the interior will be seen every variety of mineral production, from stone and coal to pure gold, the value of which will be at least $750,000. The expense of developing this grand and brilliant conception will be assumed by the public spirited citizens of Colorado. It is intended to be a permanent exhibit, open every day the year round, and its originators desire to have the choicest specimens of mineral wealth from every State in the Union represented side by side with the resources of Colorado. Building stone, granite and marble are also desired. The building will be lighted by 3,000 incandescent electric lights. It is the intention to reproduce this in duplicate of design and brilliancy of decoration and display, but somewhat reduced in size, as the Colorado mineral exhibit for the World's Fair, in Chicago in 1892, should that scheme materialize.

Gold Mining in British Guiana.—The last shipment of gold—3,483 ounces, valued at $62,000 in round figures—is the largest on record in the Custom house books, the largest exports by a single mail hitherto having been those of 2,263 ounces a few weeks ago, and 2,514 ounces in December last. Including the latest shipments above mentioned, the gold returns for the year show 12,884 ounces, valued at $231,632. Last year, up to 15th April, there had been sent away 5,846 ounces, declared to be worth $100,171, from which it will be seen that, as far as it has gone, this year's export has been more than twice as large as that in the corresponding period of 1889. The gold royalty for 1890 stands at present at the respectable figure of about 11,500 ounces.

Meeting of the General Mining Association.

The annual general meeting of the proprietors of the General Mining Association, Limited, was held at the offices, Blomfield House, London Wall, E.C.

Mr. J. Duke Hill, who presided, formally moved the adoption of the report and account, and that a dividend of 6s. per share be declared.

Mr. F. W. Bigge seconded the motion.

Mr. Descou complained that the meeting had not been called earlier. It seemed to him that four months was a long time to wait to complete the accounts of the association. He also suggested that the proprietors should be furnished with a report of the affairs of the Association more often than onee a year.

Mr. Swan stated in reply that the preparation of the accounts at the mines took some time to complete, and then they had to be sent to London. It would be useless for the board to send reports out as often as Mr. Descou had suggested, as there would be nothing to communicate to the proprietors.

The motion was then put and carried.

After the re-election of the retiring directors, a vote of thanks was given to the chairman for presiding.

The Immense Profits of the Tharsis Sulphur and Copper Co.—In spite of the fall in the price of copper, the net profits earned last year by this company amounted to no less than £249,189 15s. 6d., enabling the directors to maintain the previous year's dividend of 20 per cent. Over and above this immense profit the company has a claim against the Societé de Méteaux for £263,915 1s. 6d. It may be of interest to add a line as to the dividends that have been paid by this company. In the first year of its existence (1868) it paid a dividend of 10 per cent.; in 1869 5 per cent. was paid, but this rate advanced till 40 per cent. was reached in 1872. Since then the rate has averaged exactly 20 per cent., 27½ per cent. being paid in the two years 1882 and 1883, and 7½ per cent. in 1886.

'Eiffel' Tower for the World's Fair at Chicago.—M. Eiffel, who erected the great Eiffel tower, which formed such an important and successful feature of the recent International Exposition in Paris, has made a proposition to the World's Fair directors to erect a similar structure in Chicago, and to provide the entire capital needed for its construction, should the directors approve of his proposition. It will be the joint enterprise of M. Eiffel and Thomas A Edison, and the tower will be higher than the original structure by at least 500 feet. Mr. Edison, it is said, will place a million incandescent lights of various colors upon the structure.

A Dry Machine for Alluvial Gold.—The Whitty machine which was successfully tried at Johannesburg the other day is thus described: It is a green looking affair of perhaps seven feet in height; simple enough in its working and doubtless meritorious enough to ensure something of the boom anticipated by the American company who are introducing it. The machine was at work the other afternoon in the yard to the rear of Messrs. Turner's premises in Simmonds St., Johannesburg. According to Mr. Whitty—and as was pretty plain to all—the machine was simplicity itself. The virgin soil is first put through the clod breakers, which are fixed with screws so as to reduce the wash to a proper size to enable it to run through the separator. It is then placed in a hopper with an automatic feeder, which distributes a thin layer over the amalgamating plates, so constructed as to hold continuous walls of mercury in the shape of rifles. All the finer gold is amalgamated on the first plate; the coarser gold and pebbles falling into the concentrator beneath—a pecific gravity plate of rough canvas on which is laid the mercury charged rifles. An intermittent force of air comes from the bellows, behind which, striking the canvas plate, drives the tailings on to the floor, the rougher earth and probable gold being held in tow for the examiner. Which, being interpreted, means that the dry earth is poured into a box at the top of the machine, is allowed to drop through by automatic action on to the sensitive plate beneath, where cascade fashion, it dribbled down to the bottom, leaving its golden wealth (if any) behind in finer particles and taking the rougher and more acceptable nuggets to the plate beneath. This plate being of canvas is blown at by an automatic Boreas behind, the result being that while the superfluous earth is blown to the ground as tailings, the pebbles and nuggets remain, attracted by the gridiron arrangement, topful of irresistible mercury. Then when the business is over for the day, these concentrates are swept off in a pan, and the nuggets picked out as easily as winkles. The hand power of the machine, it was stated, will treat between 15 to 20 tons of earth a day—a fact which, contrasted with the present method in use, speaks for itself. The earth must be dry—the dryer the better—before it can be treated; and the machine itself is adapted either to hand labor or working by steam.

Our Portrait Gallery.

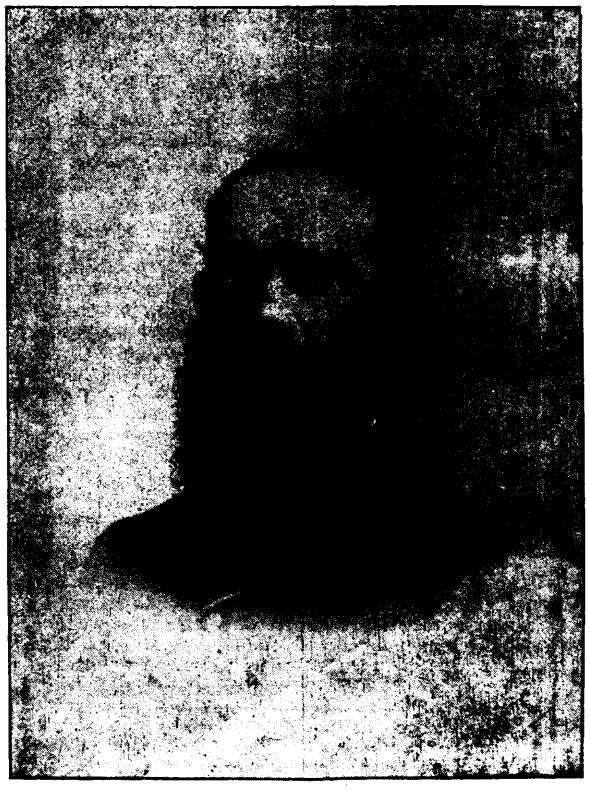
[A series of portraits and biographical sketches of Canadian mining engineers, mine managers. inspectors, geologists, explorers, etc.]

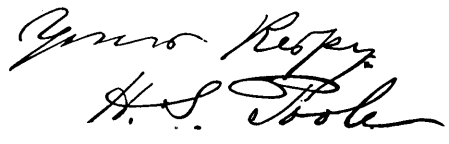
No. II.

Mr. H. S. Poole, General Manager of the Acadia Coal Co. (Ltd.), Stellarton, N.S.

Mr. H. S. Poole, General Manager of the Acadia Coal Company (Limited), and formerly Inspector of mines for the Province of Nova Scotia, was born at Stellarton, N.S., in 1844. He is the son of the late Henry Poole, a well known mining engineer, who managed the Albion mines for fourteen years prior to the surrender in 1887 of that company's monopoly of all the minerals of the province, and who also reported for the Government on the newly discovered gold fields in 1863, and still later was manager of the Caledonia Colliery in Cape Breton.

Mr. Poole is a graduate of King's College, Windsor, and is an Associate of the Royal School of Mines, London, where he studied under the well known leaders in science, Professors Hoffman, Huxley, Tyndall, Smith and Percy. He has been a Fellow of the Geological Society since 1866 and is a member of several other scientific societies, to which he has contributed papers. When the Canadian Society of Civil Engineers was formed he was honoured with a seat at the first Council Board. Having finished his studies in London and returned to Nova Scotia he was employed under his father's management at the Caledonia Colliery, Cape Breton, where Mr. David MacKeen, M.P., is now Managing Director and part owner. There he remained until 1870, when he went to Utah and Nevada, mainly to benefit his health, but also in a professional capacity, to report on some silver mines. As an episode in this portion of his career, it should be stated that he was for a month with a Japanese Commission at Washington, at the time when that wonderful people were boldly casting off their venerable civilization for that of the more restless West. Afterwards he spent a year among the silver mines of Utah. In 1872 he once more returned to his native province to succeed Mr. John Rutherford as Inspector of Mines, and this position he filled with great credit to himself and to the province for a period of six years.





As Inspector he marked his term of office by inducing the Government of that day to adopt for the better regulation of the mines an Act based on that of England, and he added thereto, with Government concurrence, special clauses having in view the preservation for future miners of approaches to the large submarine coal field that extends off the Cape Breton coast. He also remodelled the forms on which information is annually given to the public in the official reports to the Department, giving them the shape they continue to have to-day.

Nova Scotia owes much to Mr. Poole for the fearless conscientious discharge of his duties as inspector during the years in which he held this office, for his efforts to enforce the authority of the law and secure that discipline and attention upon which the safety of the mines depends. Of the Annual Reports we can only speak in terms of unqualified praise. The work of the Department was not limited to the collection of royalty from the mines or to the publication of statistics of the yield, value and destination of their products, useful chiefly to the economist and historian. The Inspector was by training and experience quite competent to instruct owners as to the best means of opening and working mines and of utilizing and marketing their products, and to recommend modifications and improvements in mining practices which had been adopted elsewhere. The reports became valuable memoirs on the great mining industries of Nova Scotia, descriptions of the coal, iron, gold, manganese, antimony, copper, lead, gypsum, barytes, limestone and other economic ores and minerals; of their modes of occurrence, of every question of practical application to their extraction; of the cost of production, the labour and materials employed. Methods of mining were compared with those in use in other countries; a complete history was given of the growth, progress and condition of every mining district, and suggestions made for their future development.

In his first Report, which contains numerous carefully compiled statistical tables, references to mining practices abroad, to appliances for coal cutting, to the use of dynamite in the gold mines, Mr. Poole urged the necessity for greater attention to the condition of the mines and for the enforcement of stringent rules to guard against the recklessness with which miners will expose their lives to dangers which, although known to be imminent, are familiar, invisible and temporarily doubtful. He insisted that immediate revision of the law relating to mines was preferable to waiting until some appalling accident, from which happily the province had hitherto been free, too plainly should point to the necessity for legislative interference. The warning was not too soon. This report was written on February 15th, 1873, and on May 13th occurred the disaster at the Drummond colliery, an explosion of gas in a fiery portion of the mine by the careless use of powder, which resulted in the loss of sixty lives and a greater destruction of property than in any previous similar occurrence in America.

The next annual Report recommends some improvements in the handling of coal, points out the necessity for complete and accurate plans of underground workings, and further advocates that the law should require that those in charge of mines, all colliery officials such as managers, deputies and firemen, should be men in whom trust can be placed, men who by practical experience and professional education are fit to fill the positions they hold, and should be required to possess certificates according to their positions. It condemns the Arab-like wanderings in the gold fields of irresponsible tributers who try new places, open up old mines and again abandon them, stripping the outcrops of the leads and making them reservoirs for water, and but temporarily securing the openings. Interesting sections are given of one of the leads in the Montague district, to show the distribution of gold in different parts of the workings.

Among the questions considered by Mr. Poole in subsequent reports is that of the duties of the inspector and the extent of his responsibility as compared with that of those in charge of the mines, whose constant care and watchfulness, coupled with good discipline, he shows to be the only safeguards against accidents. The history of royalties and a comparison of the custom of Nova Scotia with that of other countries, leases, spontaneous combustion of coal, colliery machinery, ventilation, explosions in mines, submarine workings, review of the coal trade, boiler incrustations, treatment of gold-bearing ores, tables of analyses of iron ores —these and other cognate subjects of practical interest are concisely treated with extraordinary ability in his reports.

In 1876 he contributed much valuable information to the Royal Commission, of which the Rt. Hon. Mr. Childers was chairman, and it is published in their report on the spontaneous combustion of coal in ships.

In 1879 Mr. Poole resigned his position as Inspector of Mines to take that of manager of the Acadia colliery at Westville, made vacant by the failing health of the late Mr. Jesse Hoyt.

Previous to 1886 there were four active coal companies competing in the Pictou Field, whose operations did not always result advantageously to their respective shareholders, and in that year three of them—the Vale, the Acadia and the Halifax—were amalgamated. Mr. Poole, who previously had acted for the Acadia company alone, was placed in general charge. The amalgamation consolidated leases cover some 13 square miles, of which but a portion is at present known to contain workable beds of coal. The management of this property involves the consideration of many serious problems, the record of the district being anything but enviable; calamities by explosions of gas, irruptions of water, and loss of pits by subterranean fires, which have continued to smoulder and occasionally break out destructively, have marked that of the past twenty years.

The pits in Pictou County are the deepest in the Province. The Acadia pit has workings under 1,500 feet of super-incumbent strata, with depth not only is the cost of pumping water and winding coal seriously increased, but the resulting pressure adds to the expense of maintaining the necessary roads.

Thorough, painstaking and careful, intimately acquainted with everything about the mines, as manager he inspires confidence in his professional knowledge; not readily swayed by prejudice or passion, solicitous for the welfare of the miners, affable and easily approached, he is liked and respected, but permits no disobedience of orders. His managers at the Acadia and Albion mines, Messrs. James Maxwell and J. G. Rutherford, are instructors in the Government schools for miners, while Mr. W. B. Moore and T. M. Turnbull are in charge of the Vale. The mine with which he has been longest connected is the most successful in the district. The importance of these coal mines is shown by the prosperity of the neighbouring towns of Pictou, New Glasgow, Westville, and Stellarton, and of the whole county of Pictou. To win the coal at great depths in fiery mines from beds thicker than are worked elsewhere, but of changeable character, highly inclined, interrupted by faults and having often a dangerous roof; to recover or avoid breaking into old workings, are problems which tax to the utmost the powers of the mining engineer entrusted with the lives of hundreds who are engaged in a perilous occupation, he must foresee and guard against danger and loss, and husband the resources of the mines. The responsibility is heavy, but in every crisis Mr. Poole has done, and will do, all that coolness, skill and promptness to plan and execute can effect.

As the observant practical miner and mine engineer often makes a good geologist, Mr. Poole has also set himself with equal success to solve certain vexed questions in the geology of a province which has produced many geologists. In 1873 he read before the Nova Scotian Institute of Natural Science a paper on the geology of the Nevada silver mines, the great American desert, the gravel benches, hot sulphur springs and changes of level of the Great Salt Lake. In 1879 followed a contribution to the Geological Society of London, of which he has been a member for more than twenty years, "On the Gold Leads of Nova Scotia," in which he agrees with Dr. Selwyn of the Geological Survey in regarding these leads as true mineral veins, rather than as beds of contemporaneous age with the quartzite and slate in which they are enclosed, as assumed by Professor Hind and Dr. Hunt, thus "rendering a most useful service to geology in completely upsetting the theory of the bedded origin of the leads." He maintains also that the granites of the gold fields are of intrusive origin and not merely highly metamorphic rocks. In other papers he has discussed the question of the glaciation of the country and the origin and course of the drift.

In 1881 he read before the Institute of Natural Science "Notes on the Ice Storm of January 24th, 1881"; in 1885, before the American Institute of Mining Engineers, a paper on "The Pictou Coal Fields," including, besides particulars regarding the machinery and methods of working at the different mines, an account of the geological structure of the coalfields, of which he has since that time made a much more thorough survey; and in 1889, before the Canadian Society of Civil Engineers, "The History of One of the Oldest Railroads in America—that between the Albion Mines and the loading-ground."

It should be stated that Mr. Poole is also Vice-President of the Nova Scotia Steel and Forge Company of New Glasgow, a concern that has spent $400,000, chiefly of local capital. As is well known this enterprising company is doing a large business, and is now proposing to include a blast furnace. The products are open-hearth steel, nail plate, machinery steel, car axles, &c., &c.

We hope to include in our next issue a sketch of Mr. Archibald Dick, Chief Inspector of Mines for the Province of British Columbia.

The Canadian Rand Drill Company give notice of an application for incorporation. The applicants are:—Addison C. Rand, of the Rand Drill Co., New York; S. W. Jenckes, of the Jenckes Machine Co., Sherbrooke; J. M. Jenckes, Sherbrooke; F. A. Halsey, Mechanical Engineer, and Wm. Farwell, Manager of the Eastern Townships Bank, all of Sherbrooke. The capital stock will be $18,000, in 180 shares of $100. The company will manufacture in Canada, Rand Drills, Air Compressors, General Mining Machinery and supplies.

PHOSPHATE.

In General.

Mr. G. C. Lomer, of the firm of Andrew Hunter & Co., London, has arrived on this side for a short visit, and will make a trip through the mining districts.

Markets.

The European market is weak on account of a drop of one penny unit in Charleston, and the lower freights that are ruling. Manufacturers are busy on the other side at present in manufacturing and shipping manufactured goods, so that they are in no humor for purchasing.

Shipments.

Messrs. Lomer, Rohr & Co., Millar & Co. and Wilson Green have been making regular shipments to Europe since resumption of navigation, from the port of Montreal. Full particulars of quantities exported per ocean freight will be given in our next issue.

The shipments of ground phosphate from the Ottawa Valley to United States, from 1st January to 30th ulto., have been:—

Month.	Quantity.	Designation.
January.....	7½ tons.	Holyoke, Mass, US
February.....	340 do	Holyoke, Mass, US
March..	100 do	Holyoke, Mass, US
April	200 do	Holyoke, Mass, US

Kingston District.

The Kingston Phosphate Mining Co. has been registered in London, with a capital of £5,000 sterling, to acquire and work the property adjoining the Foxton mines. Messrs. Lomer, Rohr & Co. have been appointed agents in Canada.

Active operations have been begun under the new management at the Bobbs Lake Pits, formerly operated by the Anglo-Canadian Phosphate Co., and from present indications a large output is expected.

Templeton District.

At the McLaurin Co.'s pits work progresses satisfactorily. About 100 tons per week are being mined from the Blackburn.

Freights.

Messrs. Lomer, Rohr & Co. report having made contracts for London and Liverpool at 5s. per Tramps.

Lievres District.

Operations at the North Star, High Rock, Emerald and Central Lake Mines are being pushed vigorously, and satisfactory shipments are being made.

The Anglo-Continental Guano Company, operating the Aetna Hill and Lansdowne properties, purpose to submit to arbitration the dispute respecting the line dividing their property from that of the Ottawa Mining Co. A re-survey by independent surveyors will probably be made. The Anglo-Continental Company estimate that about 2,000 tons of ore have been taken out of the workings on their side of the line.

The Canadian Phosphate Company expect to have a large increase in their shipments this year. The pits are all doing well at present. A full report of the annual meeting of shareholders is given in another portion of this issue.

The annual general meeting of the Dominion Phosphate Company was held at Montreal on 20th inst. The report of the year's operations was very satisfactory, inasmuch as a very large output of high grade phosphate was made, resulting in a most satisfactory profit to the shareholders. Mr. R. N. Hall, M.P., has returned to London to complete the negotiations for the transfer of the mines to the English syndicate by whom they have been acquired. At date of writing Messrs. Charles Kyte and John Williams, of New York, directors of the company, are visiting the mines. Capt. Williams and a small force are placing the property in good shape for transfer.

MINING NOTES.

Nova Scotia.

Strong winds have at last driven off the drift ice, and Pictou Co. is prepared to ship coal, but no craft has yet loaded for Montreal; all shipments so far have been local. Mining questions have for the present been laid aside here, and local politics absorb all attention, the election being on the 21st inst.

During the session of the Nova Scotia House of Assembly just closed, the Committee on Mines and Minerals made a report recommending the separation of the Department of Public Works from that of Mines. This separation would be in the interest of the mining industry, and has been advocated for some time by the Gold Miners' Association. The public have suffered for years from the lack of proper clerical force in the Mines Department, and from the lack of a Commissioner who could devote his whole time to that Department. The business of the Mines Office has grown wonderfully in recent years, and is still increasing, and its receipts are nearly one-third of the total revenue of the Province. Under these circumstances the Government could pass no single measure which would meet with more approbation from those concerned in mining than that recommended by the report.

The Committee also inquired into three petitions which claimed damages for mistakes and errors committed by the Department. In the petition of Hemeon no claim was allowed; in the petitions of Thompson and of Cameron damages were recommended to be paid.

The Nova Scotia Steel and Iron Company, New Glasgow, N.S., operating under a new charter granted by the Legislature of Nova Scotia, have issued a prospectus relating to their business. The authorized capital is $2,000,000. The company are now employing about 450 men, and look to increasing the number as soon as they get to work building their blast furnace, etc., which will be immediately.

The steamer *Eveline* which was to have opened the St. Lawrence coal trade with a cargo from Cow Bay got on the rocks and is being repaired at Halifax.

The miners at Cow Point have returned to work, the management having abolished the weighing complained of, and it is expected that an advance in coal cutting rates will also be conceded.

Mr. John McIntosh, Stellarton, has secured the contract for erecting twenty coke ovens for the Intercolonial Coal Company, Westville. The ovens will be of the beehive pattern. It is said after these are built more will be constructed.

Mr. A. R. McDonald, who has spent some time prospecting for coal near Little Harbor, claims to have found a promising outcrop near Woodburn, New Glasgow, and is forming a company with a view to further explorations thereon.

Wine Harbor District.

New hoisting and pumping machinery is now erecting on the properties operated by Mr. H. T. Harding, of Truro. These properties for some time have required more powerful machinery, and when the new gear is in place the output will be materially increased. The engine was built by W. W. Howell & Co., of Halifax.

Mr. Robt. McNaughton has begun work on the areas immediately east of the Harding property. A shaft in the middle lode has been cleaned out and is now sinking.

Sherbrooke District.

Work in the Peninsula Co.'s mines has been temporarily discontinued.

At Goldenville little or nothing is doing. The exorbitant prices at which idle properties, which are really nothing but prospects, are held, are effectual barriers in the way of reviving this district.

Beaver Dam District.

Mr. Turnbull is erecting a small saw mill to cut the lumber for his new stamp mill. A large portion of the iron work and machinery is on the ground, and the work of erection is going forward steadily.

Yarmouth District.

It is reported that F. W. Christie has obtained a working lease on the old Cowan property. It is also rumored that a suit has been instituted by some creditors of the old company for non-payment of debts.

Gay's River District.

M. B. Gladwin, acting for a syndicate, has put down a shaft through the conglomerate in this vicinity and found gold-bearing material below. The shaft lies at some considerable distance from the old mines, and to the northward.

Nothing is yet doing on the Anderson-McDonald property, formerly McClure's, but it is understood that work will be resumed this summer.

Stormont District.

The Palgrave Co. are still idle, awaiting the issue of some legal matters.

The North Star lode is looking well. The lode runs from six to ten inches in width, and is reported worth $40 per ton. A new wharf is under construction near the property, and arrangements have been made with the packet steamer to land at that wharf.

Renfrew District.

C. H. North, the owner of the "Empress" mines in this district, has decided to unwater and prospect the old "Ophir" lodes upon his property. These lodes, particularly the South Ophir, were the chief producers some fifteen years ago, and are opened to a depth of about 400 feet. Mr. D. S. Turnbull, superintendent of the Empress Co. is putting in dams and a Vulcan wheel, the object being to transmit all the power required for unwatering and developing from the falls in Meadow Brook to the Ophir shafts, a distance of some 700 feet. Mr. Turnbull will use a ½ inch endless wire rope, the slack being carried on idlers, three feet in diameter. The driving pulley will be 10 feet in diameter, and the driver 6 feet in diameter.

Malaga District.

The Malaga Mining Co., Ltd., have reduced their force of miners.

The Parker-Douglass Co. have about completed their surveys for the transmission of their power from Wildcat Run. The Truro Foundry Co., which is the only concern in the Province having any experience in this matter, are making estimates on the transmission by wire rope. The Sprague Electric Motor Co. are in correspondence with reference to transmission by electricity.

Quebec.

Quite a number of new engines are being added to the different plants in the asbestos region. Bell's Co. have a new hoisting engine, and Messrs. King Bros. are putting in a complete plant of hoisting and air compressing machines.

The Anglo-Canadian Asbestos Company at Black Lake is working ahead full swing and making good progress. Recent operations have exposed some very good ground to the rear of the property adjoining that of the United Asbestos Company. A new hoisting plant has been put in to extend the workings at this point, and the management contemplate some still further additions to their plant.

The Beaver Asbestos Co. have their machinery on the ground and it is being put in place with all speed. Very little work has as yet been done on the property of this company, but the openings that have been made, show numerous veins of fine clean asbestos of the usual Thetford quality.

The Thetford Mining Co. have resumed operations at their pits. Work on this property was suspended in the autumn.

Work at the pits of all the companies is being pushed with the usual energy and all are striving to improve on last year's output, as is evidenced by the addition of new and improved working plants.

At Black Lake, Bell's Co. Southward mine has not yet been opened.

On the property of the United Asbestos Co., (limited) new ground is being opened and all the pits look very promising. There are at present four pits working.

Messrs. King Bros. have commenced work on their property near the Black Lake Station. The asbestos shows in good quantity and the veins are good sized.

The American Asbestos Co. (limited) are working a good force and their pits look very nice. On the hill they are putting in a new hoist to be run by compressed air. They are laying down larger pipe and will put a large Receiver on the hill so as to command a better supply of air. A vein taken from one of their pits a few days ago measured about 7½ inches in width. This is perhaps the largest that has ever been found at any of these mines. Several pits situated at too great a distance to be operated by their own machinery are being worked by contract.

The Exploration Co. of D'Israeli are erecting a building on the Lot adjoining the Laurier Co. and are also doing some exploring.

Some exploring has been done on the Lot taken by the Laurier Mining Co.

We are much pleased to learn of the formation of a union of the asbestos mine-owners and managers, to be styled "The Asbestos Club," with head-quarters at Black Lake, Que. The aim and objects of the club, are :—

a. To promote meetings of persons directly or indirectly interested in the mining and manufacturing of Asbestos, in order to discuss matters of mutual interest.

b. To keep on file a selection of suitable newspapers, periodicals, books, etc., for the use of members.

c. To give impartial information about mines and properties, to the benefit of asbestos mining in general.

d. To try to adopt such measures which will enable the various mining companies to insure their employees against accidents, etc., on a co-operative system.

e. To act as arbitrators whenever called upon to settle disputes between parties connected with the club.

f. To promote social intercourse of members and their friends.

The new club starts with a membership of 35, including not only the local managers, but others interested, directly or indirectly in the industry, resident in New York, Boston and other outside points. We heartily commend the club to those who may not already be enrolled among its members and wish it every possible success. A suitable building has been secured and is being comfortably fitted up. Visitors to the asbestos region will find the club a most useful institution and an excellent medium for imparting reliable information regarding the mines and the resources of the district. The formal opening of the club will take place on the 24th inst.

The work of increasing the capacity of the Fertilizer Works of Messrs. G. H. Nicholls & Co. at Capelton has been commenced. A building 200 feet long by 75 feet wide, three storeys high, with an ell attached 175 feet long by 65 feet wide, is under way. For the buildings 250,000 feet of lumber will be required.

The shipments of iron ore from the Bristol Iron Mines to the United States, from 1st January this year to date, have been :

	Tons.
January	923
February	1149
March	846
April	1279

The shipments were made to the Crane Iron Co., Catasauqua, Penn.

The project of utilizing the peat of the Ste Brigide swamp has not yet been abandoned. The experiments by the Ste. Brigide Peat company show samples of carbonized or compressed peat of the density of coal, and said to be equal to coal in heating properties. Mr. Aikman, the manager of the company, has confidence in the ultimate success of the works, ond declares that manufactured peat can be tnrned out f.o.b. cars for $2 per ton. Mr. Taylor, an English mining engineer, recently examined the beds and works, and gave expression to his conviction that the swamp lands of Ste. Brigide will yet prove to be of commercial value. There is a report that a syndicate will shortly be formed to push the enterprise.

Commenting upon an announcement of the meeting of the shareholders of the White's Asbestos Company called for 2nd ulto., the London *Star* has the following:—"There is to be a meeting of the shareholders to-morrow, but we are informed that it is to be of a strictly private nature." We can understand that, and the public can draw their own inference as to why the directors are unwilling to give publicity to their statements respecting the position of the Company. Exactly a year ago, when this concern was placed on the market, we called attention to certain exaggerations and mis-statements respecting the value and capacity of the properties to be acquired and we warned investors to look carefully and cautiously into the seheme before putting their money into it. We are now curious to know just exactly how much asbestos was raised from the South Garthby lots, about the value of which the promoters made so much ado in their prospectus. All is not gold that glitters, and all serpentine is not asbestos bearing is an adage the full mean-

ing of which the shareholders of the White's Company no doubt, now fully realize. It should be the endeavor of every one engaged in legitimate mining to discourage any attempts that may be made to flood the market with undeveloped and sometimes unprofitable areas, at figures which even the most profitable mines at the present time would scarcely warrant.

Ontario.

The Wright lead mines at Temiscaminge have, we have good reason to believe, been acquired by a strong New York syndicate. Mr. John Williams, M.E., of New York, is now at the mines putting the plant in order, and making arrangements for a resumption of active operations.

Just as we go to press we have received a copy of the long looked for Report of the Royal Mining Commission. We will make some extended reference to the work of the Commission in our next issue. An edition of 7,000 copies, bound in half leather, has been issued.

The manufacture of "Portland cement" from clay and marl, obtainable near Kingston, will be undertaken by Mr. Lenderoth, a German specialist thoroughly acquainted with the business, provided the necessary capital and a suitable site are obtainable. The inexhaustible supply of the best raw material, and the cheapness of manufacture, with best facilities for shipment, should be inducements to favor the project; and it is to be hoped Kingstonians will not be slow in affording the country an opportunity to buy at home so valuable an article, without sending $200,000 a year to Britain and Belgium for this building material.

Port Arthur District.

The chief matters of interest are the proposed subsidies by the Dominion Government to the extension of the Port Arthur, Duluth and Western Railway to the gold areas in Moss Township, and to the Kakabeka Falls town site. With these branches, and the extension of the C. P.R. line to the Atikokan iron range, the output of ore from this port would assume an importance which would undoubtedly bring this section rapidly into notice as a most desirable field for investment, especially for the extent and variety of its mineral resources.

There is nothing of special moment to note in reference to successful development and output of the various silver mines. A company is now being organized here, assisted by English capital, to secure options on promising properties, and make such necessary preliminary outlay as will determine their probable value, with a view of promoting companies for the purchase and operation of such as warrant such a course. A company of this nature, composed of honorable, experienced men, would be of great service in enabling explorers and others to have their finds tested and sold—a very difficult matter when we consider that the majority of explorers are men without means. Many valuable properties which now lie dormant would spring into life.

At the Badger, two shifts are at work south of Badger mountain cross-cutting for the vein. Explorers are at work prospecting the whole of this company's property, and it is expected that the new work, in connection with the energetic developments carried on at the old workings, will make the Badger output for this year fully up to its excellent record of the past.

The Silver Glance property, north-west of Whitefish Lake, and adjacent to the Silver Fox and Mink Mountain properties, reported sold last week, is, we understand, finally secured by a French Banking Company. Your correspondent has taken silver from this vein, and seen magnificent samples of native silver, which would indicate that this French organization have secured such a property as will induce them to take hold of other claims. Work will commence almost immediately.

The new manager of the Shuniah Weachu mine—Mr. Macdonell—is daily expected out from England to take the place of Capt. Thos. Tretheway, who is moving into Port Arthur.

Several locations of manganese have been taken up lately, and, in connection with adjacent iron finds, may prove of great value. Another new metal has also been discovered, said to be a silver ore, which has puzzled the local experts. Samples have been sent to mineralogists for determination.

A new mining map of the mining districts between Port Arthur and Hunter's Island, and including the Atikokan iron region, is being prepared by Messrs. Russell & Co., Land Surveyors, Port Arthur, and will shortly be lithographed. The want of a reliable map of this region has been a serious drawback for a long time past.

The Black Bay silver lead deposits are being inspected and worked by Duluth capitalists, on option, at good figures.

The directors of the Silver Glance Company are M. Ed. Schuberth, Consul de la Républic de Nicaragua, 139 Cannon St., London, E.C., M. C. Kuss, of the firm Messrs. C. Kuss & Co., London, M. L. de St. Giniez, of the firm G. de St. Giniez & Co., Banking Agents, London, and Messrs. S. J. Dawson, M.P., Walpole Roland, M.E., A. R. Lewis, J. J. O'Connor and Mayor Squier, all of Port Arthur, Ont. We understand that some 550 odd shares of $5 have been subscribed for in Port Arthur alone, and fully paid into the bank within one week of issue; and this, in a district where the chief aim is supposed to be the discovery, development and sale of mines, must be regarded as a very favorable sign in favor of the new company. The mine has been very favorably reported on by Dr. Selwyn, Walpole Roland, M.E., Capt. Tretheway, M.E., A. Falco, M.E., and others competent to judge of its value. The property is favorably situated for economic working, being about 1½ miles north of the line of the P. A. D. & W. Railway, now in course of construction. Development has given evidence of promising results. The capital or the new company is placed at £60.000.

Operations with the diamond drill have been discontinued on the property of the Beaver Mining and Milling Co. Four holes were drilled to a depth of 128 feet. The first hole struck the vein 12 feet below the surface of the rock, which at that point is 60 feet below the surface. The developments made with the diamond drill have been so satisfactory that Captain Hooper did not deem it necessary to go any deeper with it at that point. He will at once commence sinking a shaft at the junction of the two veins, and put that part of the Beaver property under active development. Some of the cores brought to the surface by the diamond drill were literally full of sulphide of silver, the average going about 40 ounces. The mill is now in readiness, and will be started in about one week, just as soon as the tramway from the mine can be put in shape. The mill will treat 25 tons per day, which, when the richness of the Beaver ore is considered, will run into large amounts per month. Capt. Hooper expects to double, and possibly treble, the capacity of the mill about the middle of summer.

Manitoba and North West.

The company which is developing the Turtle Mountain coal beds has asked the Manitoba Government for aid to build a railway from Deloraine to their mine, some fourteen miles. This coal has been recently distributed for trial and found satisfactory, and it is expected will be sold in Winnipeg from 5 dols. to 6 dols. per ton. The coal is got 45 ft. from the surface, in a five-foot seam. It is neither hard nor soft, makes no clinkers, and is a good steam coal.

Coal exists in large quantities on the shores of Hudson's Bay. On Long Island, opposite Great Whale River, 650 miles from Churchill, is an exposure of anthracite, containing by assay 94.91 per cent. of fixed carbon and only 35 per cent. of ash. It is probable that other seams of similar character are to be found on the adjoining mainland, where the stratification is similar. On the Missinaibi River, 150 miles from Moose Factory, there are no less than five exposures of lignite; and Dr. Robert Bell says:— "In the interval between one and two miles above this seam the whole bed of the river appears to be underlaid with lignite." On Melville peninsula, coal has been found on the shore in small quantities, but no exploration has been made to determine the situation and extent of the veins. Amongst other minerals discovered on Hudson's Bay, Professor Bell reports gold, silver, copper, soapstone, mica, plumbago and lead. Steam navigation is easily possible with such coal deposits available.

Messrs Geo. H. Campbell and H. E. Crawford, who have been to New York negotiating for money to build the railway from Deloraine to the Turtle Mountain coal fields, returned to Winnipeg on 10 inst. It is understood that their mission was successfully accomplished, but they will not make any of the details public for a few days.

The Alberta Coal & Railway company began operations at their Lethbridge colliery on the third shaft on the 15th of May. The other two are progressing favorably. Progress on the American side of the Alberta railway is being rapidly made.

British Columbia

The Slate Quarries at Golden are to be opened up and worked this summer. The quarry is located by the side of the railway track. The pitch of the slate is such that it can be quite readily mined and placed on the cars. Two colors of slate are found, one a light the other a dark blue. Experts pronounce it a very superior article, equal to the best found in the east. It is expected that a market will be supplied from the Golden quarries, extending east as far as Winnipeg, and to all points on the coast. Contracts have been entered into for supplying the slates for the Catholic and Methodist churches, now under course of construction at this point, and other large buildings to be erected this year will also likely be shingled with the slate. It is expected that slate shingles will be sold at the rate of about $8.50 per thousand in Victoria, and though they will cost more than double that of sheet iron for roofing, yet their durability will more than compensate for the extra cost of placing them in position.

Work has been resumed on the properties of the Gordon Hydraulic Company at Leech River. A large sluice, three feet wide and two feet deep, has replaced the old ditch, and there is at present ample water for piping. The company are determined to fully test the ground and feel assured that when a clean-up is made in the fall they will have good returns. When work was begun in the face of the hill last year, two days piping gave a return of $16. If the mine proves a paying venture, other ground will also likely be worked, fully five miles of good looking ground being available. There has been considerable adverse opinion concerning probable results at Leech River. "Far off fields are greenest," and perhaps it is because Leech River is so near Victoria that so much pessimism prevails about its gold-producing character.

The Hamilton Powder Company of Montreal, with a view to a further extension of their business on the Pacific Coast, are making extensive additions to their works near Northfield.

It is expected that the Cottonwood Gold Mining Company will employ about 200 men during the summer. Work is to be prosecuted with vigor.

It is reported that the Island Mountain Quartz Company will commence crushing rock this summer in Cariboo. All the old miners are looking forward to a lively time in that section, this season.

Arrivals from the Kootenai mines state that the Canadian Pacific has about 250 men at work constructing their line from Sproat's Landing to Kootenai Lake, and which will open up all the mines near the lake. A desperate effort will be made by that corporation to get the bulk of the traffic of the ores northward, which will insure cheap transportation to the miners from the start, as competition from the south is only a matter of a few months. The Canadian Pacific people propose to have their line completed in three months.

Last week Dr. Hendryx struck his large vein at a depth of 210 feet from the surface, and at a distance of 575 feet from the mouth of the tunnel. The ore looks most promising—at least 60 per cent. lead, or a high grade of silver. This is the ledge which he cross-cut last fall a width of 86 feet. The Skyline, at a depth of 175 feet, looks better than it ever has before. The ore which has hitherto been shipped from this mine yielded in Montana over $300 net per ton. The owners of this mine will erect a concentrator during the season. The Spokane Co., the Pearl Co., on Woodbury Creek, the Neosho Co., and a few others, are showing up good bodies of ore, and will score a point during the summer.

Information from Omnieca advises the discovery of pay ground in a creek twenty miles south-west of Vital Creek. The diggings are shallow, about two and a half feet deep, the bed-rock comparatively smooth where prospecting has been done. From three pans of dirt over ten dollars in gold was taken. It is "lead" gold of fine color, and experts state that it is worth $18 per ounce. Chemical tests of the ground are being made.

The Hall Bros., of the Eagle Creek Gold Mining Co., have shipped 400 tons of ore to Bute and Denver, and have obtained a result of 299 oz. of silver to the ton and 30 per cent of copper.

A new mining company composed of English and American capitalists, and several residents of Vancouver has made arrangements to mine on Siwash Creek. They have purchased from the Siwash Bed Rock Flume Company the right to mine for six miles along the creek. An experienced engineer has made a careful examination of the ground and found that it was very rich. The new company which is called the Anglo-American Mining Company, will put a $5000 plant on the ground and begin operations in a very short time. A saw mill will be erected, two steam derricks and one and a half miles of steel pipe put in.

The managers of the Great North Western Railway have finally decided to build west from Great Falls, Montanna, by the northern route by way of Flathead Lake and Kootenay River. The reason the northern route has been chosen is said to be because the people connected with that road own extensive coal fields near Flathead Lake, which are yet undeveloped. This coal is of very fine quality and is known as coking coal, and exists in large quantities. This road will bring this coal to the Kootenay and Spokane smelters, and it is claimed it can be laid down at $5 to $6 per ton.

Report of the Committee on Mines and Minerals to the Nova Scotia Legislature.

The Committee on Mines and Minerals beg leave to submit the following report on the several matters referred to them :—

No. 1. A petition from Mr. Jas. Hemeon, of Queens County, which sets forth that in April 6, 1887, a certain Mr. N. Hammett took out a prospecting license on Malaga Barrens, Queens County, covering nine gold mining areas in which the petitioner was interested ; that on the 3rd day of October of the same year, the petitioner filed an application for renewal signed by himself and a W. B. Philips, that the license was renewed to the petitioner, the name of W. B. Philips not being accepted by the Department of Mines because his transfer was not filed, that April 6, 1888, A. M. Hemeon, M.P.P., called at the mines office on behalf of the petitioner with reference to a renewal of the prospecting license, or with the object of taking them under lease in whole or in part, it does not appear which, and was informed by Mr. Carman, a clerk in the office, that they had been taken the preceding day under prospecting license by Messrs. Wade & McGuire. The petitioner further states that on one or two occasions he wrote or caused to be written letters to the Department of Mines enquiring about the areas in question, to which no answer was received. Of these illegal letters no record can be found, nor does any person in the Mines Department seem to remember anything of them. The petitioner afterwards received a letter from the Department dated Sept. 19, 1888, marked No. 1, which is appended hereto, and in October of the same year he received from the same source another letter dated October 18th, which is also appended and marked No. 2. in this letter (No. 2) he was informed that what was told A. M. Hemeon, M.P.P., April 6, 1888, to the effect that the license under which the areas in question had been held by the petitioner, had expired on the 4th April, two days before, was misleading, inasmuch as the prospecting license under which the areas were then held, did not expire until April 6th, that Messrs. Wade & McGuire did not acquire legal title, and that Mr. Hemeon, M.P.P., should have been told to come again in the following day, April 7th, when the ground would be vacant. The petitioner claims that for those reasons he was deprived of his areas, and prays that the title to them be given back to him, or an equivalent in money.

Your committee find that the prospecting license granted to Wade & McGuire was clearly illegal, and as a title, of no value whatever, and was so considered by the head of the Department of Mines, and that were it not illegal it was not renewed, but expired on October 5, 1888. The fact being that these disputed areas remained vacant from April 7, 1888 to October 18, 1888 of the same year, when they were taken by Messrs. Wade & McGuire, and are now held by them.

That though it is admitted that Mr. Hemeon, M.P.P., was misled by information tendered him by a clerk in the Mines Department, your committee, while not excusing the carelessness which induced said clerk to render such misleading information, are ot opinion that the petitioner should not have been misled thereby, for he had correct information given him in the receipt he received from the department for moneys paid by him and Hammett for the prospecting license ; that information was sufficient to show him when the license expired, and he should have been guided thereby. Your committee, therefore, do not consider the department of mines liable for damages for any loss which may have been sustained by the petitioner.

No. 2. Is a petition from Jas. Thompson, builder, of Halifax, and Kinsman Randolph, merchant, of Bridgetown, in which the petitioners state that on the 20th day of September, 1887, they made application for nine mining areas in Mt. Uniacke gold mining district ; that October 2nd, 1888, they got a lease of said areas, that said areas were adjoining certain other areas held under lease by certain Withrow & Hartlen ; that prior to the date of the lease given to the petitioners, the areas leased to Withrow & Hartlen were surveyed by B. Blois, a crown land surveyor ; that when the petitioners took possession of the areas leased to them, they found the north-east corner of the areas owned by Withrow & Hartlen, marked by a stake placed there by said B. Blois, and also that the east line of Withrow & Hartlen's areas was blazed out and cut through the woods, that there was thereby a clearly definite line of division cut and marked between the areas held by the petitioners and those leased Withrow & Hartlen.

That for the same reason that the bed rock was nearer the surface, near the said division line, the petitioners sunk a shaft over 40 feet in depth within a few feet of said division line, and afterwards sunk another shaft 70 feet deep, thirty-seven feet east from the first shaft, and fifty feet from said division line, and for purposes of ventilation, they cut a cross tunnel 37 feet in length connecting these shafts, that said shafts and tunnel were intended for permanent use.

That after the petitioners commenced work said Withrow & Co. began operations on their areas near said division line and they afterwards claimed that said line was not correctly laid down, and they then began working to the eastward thereof.

That a short time ago another survey was made by F. W. Christie, Crown land surveyor, of the areas leased by Withrow & Co., under the direction of the commissioner of mines, and by that survey it was found that the lands leased to Withrow & Co. were 39 feet short of what they were intended to be, and that the said surveyor located said north-east corner, and the eastern boundary of said Withrow & Co. areas 39 feet further east than they were previously located by B. Blois ; that Withrow & Co. have taken possession of that portion of their areas, between the old and the new lines, and at the date of the petition were working the same.

That by the moving of the line the petitioners first mentioned shaft was taken from them ; that the air tunnel is almost wholly on that portion taken by Withrow & Co. ; that the second shaft sunk by the petitioners will be available only as an air shaft ; that they will have to sink a new shaft further to the east, and that they will have to cut a new air tunnel.

That owing to the dip of the rock, the new shaft will have to be sunk to a depth of over 125 feet (125) before the petitioners can work as advantageously as they were able to do before the re-location of the division line.

That they will have to move certain buildings and plant from off that portion of the areas taken by Withrow & Co.

That their loss by reason of the change of said division line will be over $2,400.00.

For these reasons the petitioners pray that such relief may be granted them as may be just and right, and that they may be recompensed for the loss of the piece of ground in question and their improvement thereon.

As the result of investigation your committee find that the statements of the petitioners regarding the location, removal and re-location of the boundary line between the areas held by them and those held by Withrow & Co. are substantially correct ; but regarding the equity of the damages claimed, your committee are not able for reason of want of knowledge other than that afforded them by the evidence of the petitioners, to judge.

Your committee therefore recommends that the Commissioner of Mines have the alleged facts regarding the shafts, tunnel, removal of buildings and plant, also whether the petitioners have profited by gold extracted from ore mined out of said shafts and tunnel, examined by some person expert in such matters, and if it be then found that the petitioners have a *bona fide* claim for any damages, that such be awarded them.

No. 3. Is a petition from John Cameron of Melrose, in the County of Guysborough, setting forth that on the 29th of August, 1888, the petitioner obtained from the Department of Mines a prospecting license of certain gold mining areas, on the west side of Ecum Secum Harbor in the County of Halifax, for which he paid the usual fee ; that on prospecting said areas he discovered a valuable lead of gold bearing quartz thereon ; that thereupon he sold a one-half interest in said areas to one Peter Graham of New Glasgow, the consideration being $200 in cash, an undertaking on the part of the said Graham to erect machinery on and invest capital in the development of said areas, one-half of the profits of the venture to accure to the petitioner ; that the petitioner also sold to one David Smith, for services valued at $100 ; a one-tenth interest in said areas to one Donald McLean ; a one-twentieth interest for $25 to one Thomas Campbell ; a one-twentieth for $40, and to the aforementioned Graham a further one-tenth interest for certain services rendered in connection with said areas.

That on the 8th day of February, 1889, the petitioner obtained a renewal of said prospecting license.

That while the company so formed were proceeding with the development of said areas and on or about the 10th day of May, 1889, the petitioner was informed by the Inspector of Mines, Mr. Gilpin, that the areas enumerated on said prospecting license were held under lease by a certain company known as the Pittsburg Co., that the said Pittsburg Co. soon afterwards transferred their lease to a certain firm composed of John Yorston of Pictou, and the aforementioned Peter Graham, who dispossessed the petitioner :

That the petitioner claims that he is entitled to be paid by the Commissioner of Mines, as follows :—

To cash paid for license and renewal.	$ 15 00
" " claimed from petitioner by P. Graham.	200 00
" " " " Smith.....	100 00
" " " " McLean...	25 00
" " " " Campbell..	40 00
" 10 days measuring and prospecting, etc., at $2.00.....	20 00
" Coach hire from Sherbrooke to Ecum Secum	6 00
" Supplies and Sundries.....	10 00
" Damages for the loss of one-fifth interest by petitioner.....	2,000 00
	$2,416 00

That on the 13th day of November, 1889, the petitioner petitioned the Governor-in-Council for relief, and craved, in the event of such relief being refused, to be permitted to prosecute an action in the Supreme Court of the Province against the Hon. Commissioner of Mines therefor, when thereupon, the petitioner was directed to bring his claim by petition to the notice of the Legislature ; the petitioner therefore prays for such relief and damages as in the nature of his case may seem meet.

Your committee upon investigation have found that the alleged facts of the petitioner having obtained the said prospecting license ; of his having transferred certain portions of the areas covered thereby to the persons named in the petition ; of the areas having been at the time, without the petitioner's knowledge, held under lease by the aforementioned Pittsburg Co. ; of the lease being transferred by the said Pittsburg Co. to the aforementioned John Yorston ; of the petitioner being dispossessed by the said John Yorston ; and of the petitioner having suffered loss by being deprived of the title, were substantiated by evidence tendered during said investigation. Your committee therefore, inasmuch as the petitioner was misled by reports from the Mines Department, and was in consequence put to considerable expense and loss of time, and was also deprived of valuable property which he had reasonable excuse to suppose was his own, recommend that he be paid by the Province the sum of five hundred dollars, said sum of five hundred dollars to include the monies paid by him for licenses and renewals thereof.

Your committee also beg leave to report that during the investigation concerning the petition of John Cameron, aforesaid, it came to their notice, and was afterwards found to be true, that Mr. Carman, a clerk in the Mines Department, had been acting as agent for the said Pittsburg Co. ; that as such agent he promised the transfer of certain areas at Ecum Secum, among them being those given under the said prospecting license to the petitioner to the said John Yorston ; and that it was on account of misleading *data* furnished by the said clerk that the said areas were given to the petitioner in the first instance, and that from a letter written by the said clerk to John Yorston, which was produced and read before your committee, it appeared that the said clerk was at once misleading the Department of Mines and the Pittsburg Co., for one of which he was confidential clerk and for the other he was acting as agent.

Your committee deeply regret to find a person employed in such an important department as that of Mines, and in which he is a very prominent official, acting in a double capacity ; they therefore deem it their duty to bring the matter to the notice of the Legislature, and also to that of the Government.

In view of the large and rapidly increasing amount of important business coming daily before the Department of Mines and Public Works, and in view of the mistakes that, perhaps necessarily, occur on account of such increased business, your committee take the liberty of recommending that the Department of Public Works be separated from that of mines, and that each be placed under a distinct departmental head or, if such is impracticable, that the PUBLIC WORKS be placed under a DEPUTY HEAD, and that it then be transferred to one of the other departments, either that of the Attorney-General or that of the Provincial Secretary.

All of which with the papers connected therewith are respectfully submitted.

Committee. JAMES A. FRASER. T. R. BLACK. R. L. BLACK. ALLAN HALEY. JEFFERY McCALL. DANIEL McNEIL. WM. McKAY.

I agree with the above report with the exception of the recommendation in reference to the Department of Public Works and Mines. (Sgd.) WM. McKAY.

At a miner's meeting at Revelstoke, on the 19th inst., the Premier confessed that his policy of granting power to railway companies to collect a royalty of 50 per cent. on minerals found on their lands imposed a hardship upon the miners which ought not to be. He stated that he now had information which he did not have before, and he should not lay a straw on the back of the prospector saying " I can see how badly it works, and that it will seriously retard mining in the Railway Belt." He promised to have the matter adjusted.

Electric Mining Application.

One of the most extended and promising fields which can be found for the profitable and economical transmission of power by electricity, is that occupied by the mining industries of this country.

As the system of the electric transmission of power can be made to give an efficiency of sixty or seventy per cent., delivered to the mine, except in case of very long distance, it is very economical compared with the hydraulic, pneumatic, and other systems for transmission of power for all distances, greater than a few hundred feet.

The difficulties of transmitting power from the mouth of the pit to the interior of the mine, by means of steam or compressed air, though manifold, are not insurmountable, as shown by the number of plants that have been introduced, in spite of the large primal cost required for enfines, piping and machinery, and the depreciation of the apparatus with use. We have with electricity, however, a medium for the transmission of power which is more flexible and convenient than steam or compressed air, and which can be carried on conductors which are at the same time cool, pliable and comparatively inexpensive.

Where the transmission of power is desired from a waterfall situated several miles away from the mine, electricity affords the only practicable solution.

With coal mines, the generating plant consisting of dynamos, motors and steam engines can be placed near the mouth of the mine where screenings can be used as fuel, and the power distributed from that point for operating coal cutters, ventilators, drills, colliery locomotives, etc.

The motors at the mines can be placed at convenient points and distribution of power is made by easily handled and put up conductors. The wiring is convenient, safe and easy, can be run on places where piping would require great changes to be made; and wherever this system is introduced with good workmanship and supervision, it has been found to be a safe, effective and reliable method of transmission of power.

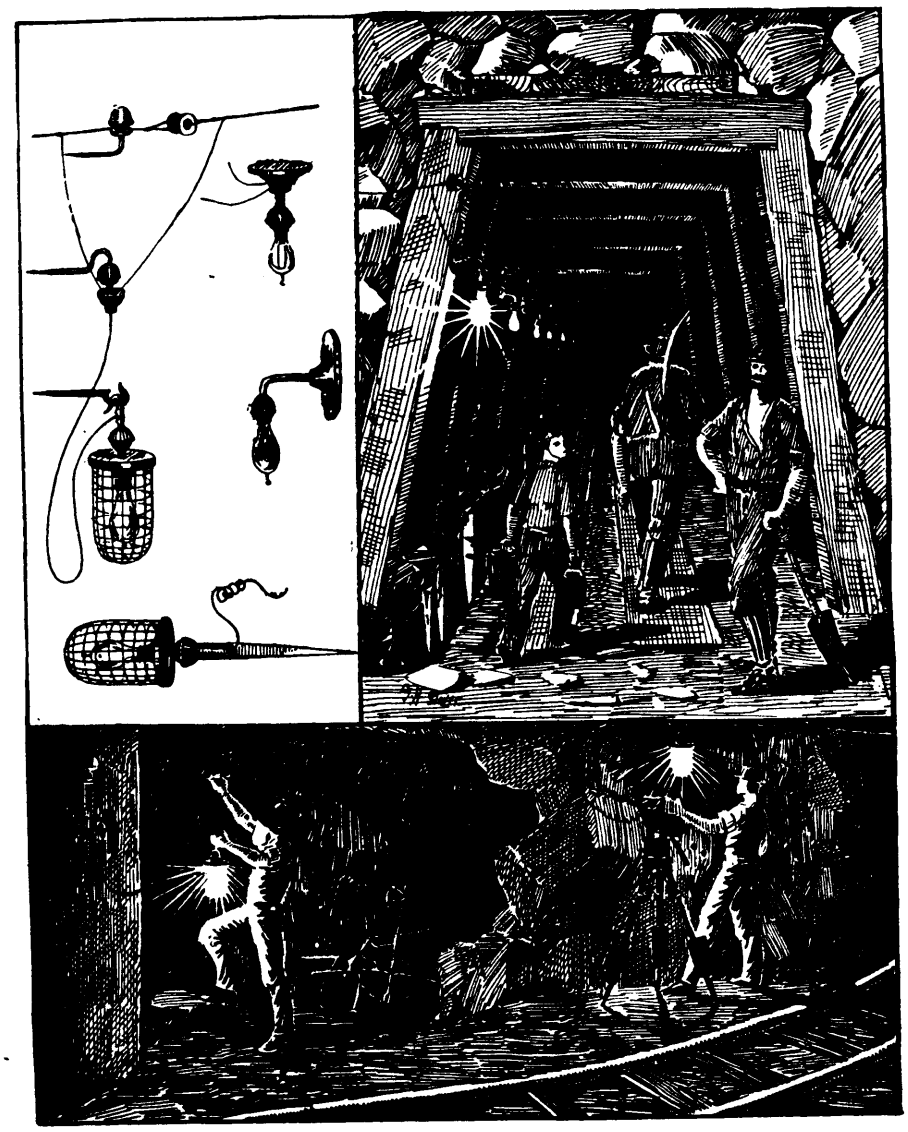
For this reason it is not surprising that so many mine owners are turning their attention to electricity, as affording the most practical and desirable method of transmitting their power and applying it to their mining operations.

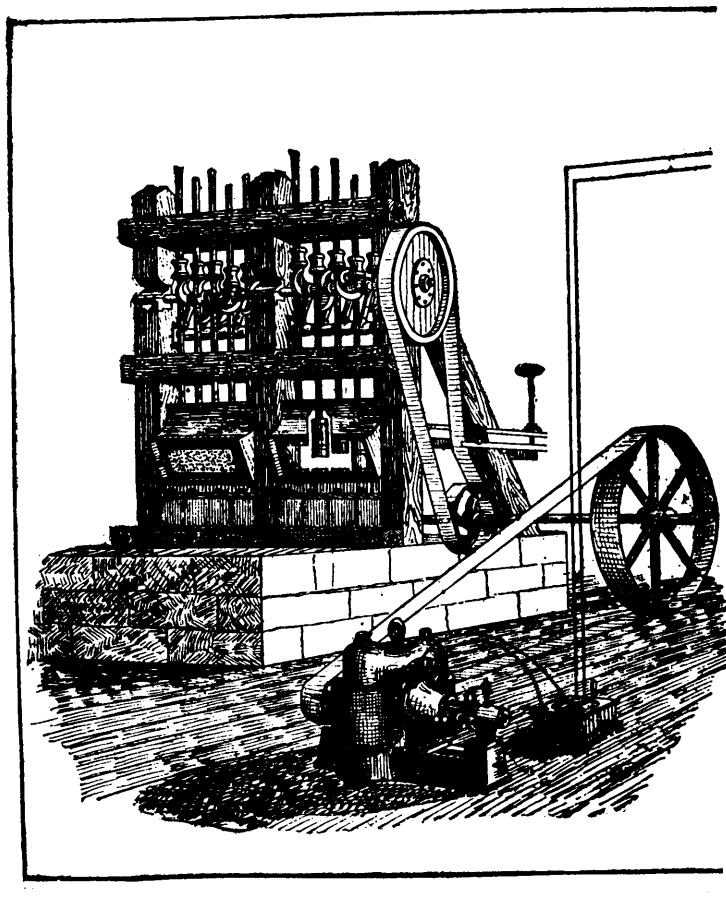
The illustrations given on this page show several applications of electric power.

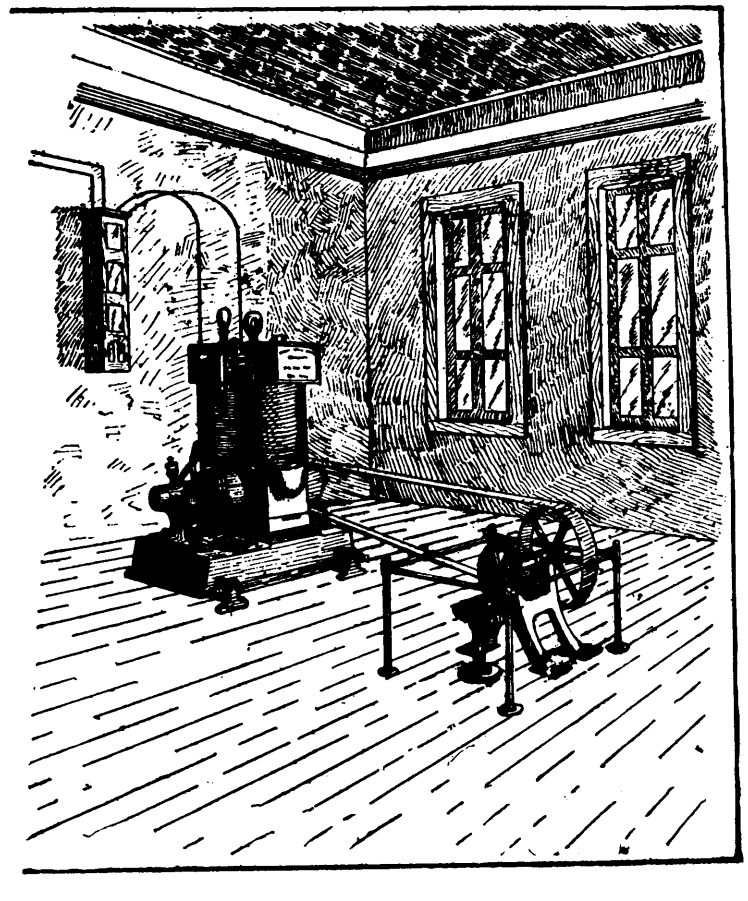
Fig. II represents the generating and receiving station of an electric plant for the long distance transmission of power. The other shows an electric generator geared to a turbine which may be several miles away from the motor, the current being carried on wires over the intervening distance.

The first view shows the interior of a mine where power and light are applied by electricity.

Aside from the ability to utilize water power or other cheap sources of energy, instead of man or animal power, in the mine, there are many advantages in the use of electrically transmitted power in mining districts in its ready application to the work in hand. It is easily handled, can be applied at any angle, requires little attention, does away with the noise and smoke of the steam plant, also with the vertical shafting, piping, etc., necessary in mining, and so saves the great loss of power incidental to the use of the same.







The B. C. Coal Mines Bill

In the Local Legislature at its recent session : Hon. Mr. Vernon, in moving the second reading of the Coal Mines Bill, said that hon. members would remember the different Acts relating to the operation of coal mines and the sale of coal lands. In 1883 an Act had been passed in which the principle was adopted of selling the coal with the land, but subject to a royalty of five cents per ton. Afterwards the difficulty of determining what was and what was not coal land presented itself, and an Act was passed providing that prospecting licenses should be issued, the prospectors simply paying a license fee of $25 per year until they satisfied themselves of the character of the land. They then might acquire their exclusive right to mine any certain area of less extent than 480 acres, upon paying the prices at which the land might be valued. Of late the difficulty had arisen of prospecting for coal existing under timber land leased by the Crown. The provision was of course secured to the Crown in all timber leases of working or prospecting for coal or other minerals. There was, however, no provision for outsiders prospecting under license, or developing coal mines under land leased for timber. It was of benefit to the province, both in the form of royalties and in the actual development of the coal mines, to have all the coal mines opened up, and the object of the present bill was to allow prospectors for coal to go upon timber land under lease, and if coal was discovered to purchase the land in the usual manner, of course compensating the owner of the timber lease. Under the present condition of affairs the land was locked up during the entire duration of the lease, which hon. members could easily see was not desirable.

The bill passed its second reading, and was committed with Mr. Tolmie in the chair. The bill was reported complete with amendments.

The Free Importation of Mining Machinery.

In introducing the changes in the tariff on imports of mining machinery, the Hon. G. E. Foster, in his Budget Speech, said :—

"The House will recollect the discussion which took place here a short time ago on mining machinery, when I urged that the House should defer the discussion until the Government had brought down its tarriff measure. All over our country the indications of interest in the development of our mining resources are plain and unmistakable ; our resources are being, every year, more and more explored ; we are coming ourselves to have a better and more adequate knowledge of the immense wealth we have in this line ; and this information is filtering out into other countries, and is producing an interest in the minds of capitalists in other countries which is continually growing, and which we believe will be productive of large investments in this country. On the whole, it appears to me that we are on the eve of large developments of the mining industries of this country, and in the future we may look for large accretions of interest and increasing employment of labor in the development of the vast mineral and metallic stocks which we have scattered throughout this country from Cape Breton to British Columbia. There has thus arisen a demand for free mining machinery. It is stated that the best and most improved machinery must be used by experimenters who put their money into enterprises the outcome of which they cannot certainly see. It is felt by them that the very best possible machinery should be got. It is felt by some that for a period at least there should be no restriction whatever on the buying of it, and by others, that there should be no other restriction than that imposed by the consideration whether or not the machinery is made in this country. Looking over the whole question, the Government have come to the conclusion that it would not be wise or prudent to resist this demand at the present time, in the interest of the development of that large part of the country's resources, and it is proposed to allow mining machinery of a class and kind which is not made in Canada at the time of the importation, to be imported into this country free for the period of three years and no longer. That will have a double effect. It will give to those persons who are investing their money in the development of our mining interests the freest market for the purchase of the best possible machinery they can get—a market, the freedom of which is only limited by the fact that the machinery they may require is made in Canada ; and no person, I apprehend, is so unpatriotic as to wish a provision to be inserted which would allow him to buy machinery out of Canada when it could be made in Canada by industries which have been fostered and brought into their present state by the operation of the tariff which we have enacted and maintained. It will have this other effect. By the free introduction of mining machinery such as is not made in Canada, and by the impetus which will be given to mining after the period of experimenting is over, and after the richness and paying qualities of these resources are demonstrated, there will be a continued and progressive development of that industry ; and after the period of three years that development will naturally add to the demand for the production of this machinery in Canada, which will, consequently, promote and encourage its manufacture after that period."

The Maintenance of Institutions for the Benefit of French Miners.

After having abandoned the construction of workmen's villages, on account of the inconveniences in point of salubrity and morality, the Mining Company of Anzin has had constructed 2,628 separate dwellings, having a garden 2,400 feet. They are let at 70 cents, $1,00 and $1.20 per month, being at least 3 per cent. less expense than the first establishment. The expenses of keeping in repair and of taxes are borne by the Company. With the object of encouraging economy, the Company sells to its workmen, these houses at cost price. They are paid by monthly instalments, about equal to the rent, and without interest. They have already sold 93 houses. They make advances on the same conditions to the workmen who wish to build. The latter has thus constructed 741 houses. The Company has a boys' school, and has given schools to the parishes ; they support several asylums and industrial schools. A special preparatory school, managed by the engineers of the Company, produces the best workmen ; it receives the best scholars of the primary school. The company has four churches consecrated to the Roman Catholic religion ; it pays the salary of two curates of these churches. Before 1887 the Company granted retiring pensions to their workmen without making any assessment on their salaries. From January 1st, 1887, it has deposited in the National Bank, pension funds for old age, to credit of the employees who made an equal payment, a sum representing 1½ per cent. of the salary of the workmen. These payments ceased when the latter reached 50 years of age. The Company further grants to those of its workman who remain in its service up to 50 years of age a supplement to their pension of 60 cents per annum of service, counting from the period whence they have fulfilled the double conditions of having at least 35 years of age and 10 years of uninterupted service. For married men and living with their wives the supplement is $1.20. A workman having entered the service of the Company at 13 years of age would enjoy by this system, at 50 years of age an annual pension of $72, and that of his wife would be $26. If he only draws at 55 years of age, his pension would be $100, and that of his wife $30. In case of infirmities or serious wounds, the pension of the workman is paid to him, and he receives a further grant, which may amount to $35 per annum. The widows of workmen killed when at work, have a claim, besides the pension paid them by the Pension Fund, to the annual grant of $36, to which is often added a supplementary bonus of the same amount. The parents of workmen killed in the service of the Company are treated in the same manner as the widows. The Company grants also pensions to the employees and to their widows. The Company grants 20 bushel of coal per month to the families of the workmen ; the quantity is increased in case of sickness, and for families having more than six children. It gives to its workmen their first clothing for work in the mines. It gives a bonus of $2.40 for each child admitted to its first communion. It lets at reduced prices grounds for the culture of vegetables.

The Board of Health service is performed under clever physicians, to whom the Company furnishes vehicles and horses. Sick employees receive gratuitously medicines, pecuniary assistance, wine, meat and soup.

Bread.—When bread is raised in price above a certain amount (about 3½ cents per lb.), the Company orders the distribution of bread at a price equal to 3½ cents per lb. These distributions cost the Company $22,000 in 1867 ; $20,000 in 1872 ; $26,600 in 1873-74. The Mining Company of Anzin made a total expenditure of $315,500 in 1888 for the maintenance of institutions which it had established for the benefit of its workmen.

Another large company, the Mining Company of Roche-la-Motiere-et-Firminy, has built two hospitals for those of its wounded employees who have to undergo serious operations or prolonged treatment, and for the dispensing of medicine to all its staff. The attendance of the Company's physicians, and medicines ordered by them, are given gratuitously to workmen and their families for 3 months, and to the families of employees who are making less than $400 per annum. Assistance in money grants is given to workmen and their families in cases of urgent necessity resulting from wounds, sickness, death, first communion, &c. The majority of households receive gratuitously 16 bushels of coal per month. The coal sold is at the rate of 30 cents per ton ; it costs the Company from $1.20 to $2.00 per ton. The company partly pays the education of their employees' children ; 350 are sent to asylums kept by the Sisters of St. Vincent de Paul, and 206 girls to the Sister's scool. It takes care, until they are 16 years of age, of 11 boys, children of workmen who have been killed in its service, eand pays the apprenticeship of 35 young girls. The expenses of hospital service cost in 1888, $13,600, of which $440 was provided by fines.

Relief Fund.—There is allowed to the wounded employee : 1st, $0·20 per day for himself ; 2nd, $0.05 for each of his children aged over 12 years. These two grants cannot exceed ⅔rds of the salary. His wife and the children under 16, wounded in the service, receive $0.10 per day.

There is granted :

1st. To the widow of a workman killed by accident in the mine, a pension :

For herself, of $0.15 for each day of the month, and of $0.20 if she is more than 50 years of age.

For each of the children, of at least 12 years of age, $0.05 per day.

2nd. To orphans of father and mother, a pension of $0.10 per day each, up to 16 years of age.

Accidents generally give rise to the exercise of generosity by the tribunals, when they concern minor children. The result is a pension or indemnity instead (or in excess of) the payments of the relief fund or the legal expenses. In 1888 the expenses of the Relief Fund amounted to $24,600. The Company grants a pension of $60 per annum to every workman who has been 30 years in its service ; this pension is only paid commencing at 55 years of age ; the widow of a pensioner has a claim for half of his pension. In 1888 the expenses of this fund amounted to $6.440. For employees not entitled to a pension, the Company provides a fund for old age, by transferring to this fund a sum equal to the tenth of the amount of all the salaries of employees. To recompense services rendered previously to the formation of this fund in 1874, the Company has deposited the sum of $11,000. Employees have a right to receive all sums at their credit after 20 years of service. The amount to distribute annually varies from $1,200 to $1,600. In 1888 the Company employed 2,691 workmen, receiving altogether $633,683 of salary. The total cost to the managers of institutions of the Company was $44,823, representing an expenditure of $16.65 for each employee, or 7·07 per cent. of salaries, or 7 one-fifth cent for each ton of coal extracted.

The Coal Mining Company of Bessèges has a sick fund, maintained by a compulsory assessment of 2 per cent. on salary ; by transferring to it the amounts derived from fines inflicted, and from loads of coal refused and charged to employees ; by donations, interests, &c. This fund grants medical care and medicine to members and their families gratuitously, and indemnity to sick or wounded employees in the service. The indemnity is from 20 cents for single men or widowers without children : 25 cents per day for married men, and 5 cents per day for each child under fourteen, up to a maximum of 35 cents per day whatever be the number of children. In exceptional cases, the fund also grants relief to families of the most needy workmen, to widows and orphans : and optional pensions to widows and orphans. These privileges are only granted by the sick fund during one hundred days. The Company assumes the cost of medical attendance. The workman loses all his rights upon leaving the service of the Company.

Fund for the Wounded. — Maintained by a monthly assessment transferred by the Company, and equal to 2 per cent. of the salaries of workmen and beneficiary employees. The fund pays all expenses resulting from charges for attendance upon the wounded. It provides for indemnity during sickness, pensions to widows and orphans, and pensions to workman wounded, or who have become incapacitated for work. The funds of this Bank, maintained entirely by the capital of the Company, are reserved expressly for those of the wounded, or their heirs, who accept literally and strictly the conditions for indemnity fixed by the Company. Consequently wounded employees or their heirs, who wish to remain independent for the purpose of entering an action against the Company, to obtain from the courts compensation for any injury resulting from accidents during work, will not participate pecuniarly in this special reserve of 2 per cent. The acceptance *of the first payment following an accident*, of pecuniary indemnity for stoppage of work, or of pensions fixed by the regulations, entails the renunciation of the right to enter any subsequent action against the Company. The Wounded Fund defrays all expenses incurred by suits entered against the Company on account of accidents. The outlay of the Fund must not exceed its resources, and in case of a deficiency, a proportionate reduction is made to all indemnities and pensions until the equilibrium is restored.

Pension Fund.—In freeing from the regulations of this fund all that which relates to the liquidation of a previous Pension Fund, we find that the Company engages to deposit annually a sum equal to 2 per cent. of his salary, to his credit, on the pass-book of every employee who engages to deposit in the *National* Pension Fund, a sum equal to 3 per cent of his salary. On the 1st of January, 1889, a fourth only of the deposits of the new staff was

transferred to the Pension Fund, all the remainder was left subject to their discretion, and independent of the offer of 2 per cent. of salary made by the Company.

Reward Fund.—Every year, grants are made to workmen distinguished for length or service, punctuality, civility and good conduct. These rewards are made in about the proportion of one-tenth of the salary.

The account of the donations of the Coal Mining Company of Bessèges in 1888 reached the sum of $69,000, equal to $28.59 for each workman.

The Annual Meeting of the Canadian Phosphate Co. (Limited).

The annual general meeting of the shareholders of the Canadian Phosphate Company (limited) was held at London, 26th ultimo. Mr. Edward Packard, jr. (the chairman) presiding. The following is an excerpt from the report for 12 months ending November, 1889, submitted to the shareholders :—

"In presenting the following report for the year ending November 30th, 1889, the Directors regret that although the output for the past year is about 50 per cent. larger than that of the previous one, the accounts do not show a corresponding profit. On the other hand, however, a large amount of development and prospecting has been been carried on, of which but a small part has been charged to capital account, and the mine has now been placed in proper working order.

"The exact quantity of ore produced during the twelve months was 6,560 tons of uncobbed ore, as compared with 4,036 produced during the eleven months ending November 30th, 1888, and the shipments to the U.S.A., Canada and Europe, during the same period, amount to 5,710 tons. Nearly 2,000 tons sold for shipment during 1889 had to be held over, owing to the scarcity of tonnage in Montreal caused by the London Dock strike.

"The main working of the old company, viz. the Big Pit at Star Hill, proving too expensive had to be abandoned last April, much to the regret of the directors, seeing that in past years very large quantities of ore had been produced therefrom at a low cost. Another old working, namely, the Bridge Pit, was pumped out and proved very remunerative, thus partly recouping the company for the loss sustained in working the Big Pit.

"Four new pits have been opened, viz., Nos. 1, 2, 4, and 6, all of which are working, with the exception of No. 1, where work has been suspended during the winter months, as the pit is entirely open and unprotected.

"The Crown Hill Mine has been fairly productive, but the ore produced having been very soft, the proportion of second quality has been much larger than was anticipated, and the falling off in profits is attributable to this. This has been especially the case with Pit No. 18, which was opened in May, and produced nearly 1,000 tons of ore before November 30th.

"The mill situated at Buckingham on a siding of the Canadian Pacific Railway has been doing good work, but the plant is insufficient at present to deal with the quantities of mill stuff produced at the mines, and a considerable part of this material has been ground at a neighboring mill. The consumption for ground low grade ore in the U.S.A. and Canada is increasing rapidly, and new contracts have been entered into at higher figures.

"The prices ruling for phosphate during 1889 were about the same as during the previous year, but since the autumn the market and demand for phosphates has expanded very materially, and the price is now from 20 to 40 per cent. higher, according to quality, and likely to remain so, owing to the scarcity of high test phosphate.

"During the last six months of 1889 the directors have been enabled to introduce some important economies in the management and working at the mines, which are now giving a much better profit, and they feel confident in being able to show a great improvement in this year's results."

THE CHAIRMAN said: The report is so full as regards the work that has been carried on by the company during the past year, that I do not know that any very lengthy comments are at all necessary upon it. The directors feel a considerable amount of regret that they are not able to propose that we should pay a dividend this year; but we have had a greatmany circumstances to contend against which were certainly unexpected, and which have militated against the successful operation of our company at the mines. One does not like to cast any reflection upon our servants, or any of those who have been in our employ, nor do I desire to do so, but I must say that I hope the difficulties which we have experienced have not been assisted to any great extent by the managers which we have employed up to the present. I may say that I feel pretty confident that the arrangements which have now been made will result in much more satisfactory work, a much more satisfactory output of phosphate, and a much more satisfactory result as regards the cost of getting that phosphate. We all know that mining operations are uncertain in their action, and that is the only certain thing which is known about mining operations. There may be, when we open up our deposits, something very profitable to work out, or it may mean that there is a considerable expenditure compared with the actual amount of phosphate produced. That the mines have been productive is proved by the statement in the report that no less than 5,710 tons have been shipped. I think we exported during last year just about one-fifth of the total export of phosphate from Canada, and I think the total export is something like 27,000 tons. As regards the demand for phosphate, there is no doubt that at the present time it is exceedingly satisfactory, especially for the class of phosphate which we have been enabled to produce. There seems to be no doubt that we shall be able to sell any quantity that our mines may turn out, and at a remunerative rate in future, as the demand is very considerable. The phosphate that we produce is, I think, in more demand than any other kind of phosphate at the present moment, and we must find a ready sale both in this country and elsewhere. We state in the report that the prices have improved. We are looking for a much better and more profitable return in the future. To what extent we can succeed in increasing the output of the mines very much depends upon the point to which I have alluded—whether we are successful or not in hitting this vein of phosphate which will be more or less productive. If anyone is particularly interested in it, and they will refer to the plan which has been made, which indicates all the workings at present going on, they will see how very important is this property. If we can succeed in decreasing the cost of output and increasing the price of material which we turn out, we shall have a much more successful time in the future than we have had in the past. I do not think it necessary for me to say very much further, except to assure the shareholders of the very great attention that the directors have been giving to the affairs of the company. The thanks of the shareholders are especially due to Mr. Millar, who has given up a considerable amount of his time in visiting the property, and who has made arrangements which, I am sure, will be very conducive to the future improvement of our position. He will be able to tell you more than I can as to the actual position of matters at the mines, because he has been there, and has taken an active part in seeing the work that is going on; so I think I must refer to him for any statement that can made with reference to the actual work, and the methods employed in carrying it out. I beg now to move the reception and adoption of the report and balance-sheet.

Mr. C. C. HOYER MILLAR, in seconding the adoption of the report and balance-sheet for last year, said: I may be able, owing to my personal knowledge of the mines, to speak rather more fully, perhaps, than your chairman about the causes of delay in getting the company into a dividend-paying state. At the time of my first visit to the mines, during January two years ago, I was unable owing to the depth of snow, to see more of your property than the three pits actually being worked at that time. It was apparent, however, that the late company, owing, no doubt, to their knowledge of the formation of the present company, had not been carrying on the work in a systematic manner. The result of thishas been that the present company was considerably handicapped at the start. It must also be borne in mind that your company is really carrying on two separate mining undertakings, one at Star Hill and one at Crown Hill. At the latter place work had only been started some six months, and the first year of this company's time was mostly occupied with putting up the buildings, fixing the plant, and laying down the tramway, and it was only last year that the mining operations there began to take proper shape. I visited the mines again last October, and made a thorough investigation of your property, and the results of my examination were most satisfactory. I also visited all the other mines in the same district, and I may say that your property can compare most favourably with any of them. A considerable amount of developing and prospecting has been carried on simultaneously with the mining operations, and the company is now well situated for producing good future results, as many showings have been discovered, and have been partially opened up, and which can be worked to advantage as opportunity occurs. It must be remembered that the Canadian phosphate mining industry, though it has been carried on for more than 15 years in a desultory kind of manner, is still in its infancy, and it is only during the last few years that any systematic methods have been followed, and some of our neighbours have recently pumped out old pits abandoned years ago, as at that time they had not the necessary machinery for working at a depth. Improved machinery and greater continuity of working are being adopted at the present time, the results of which are apparent in the increased outputs from the larger mines, and much less ore is now wasted than was the case during the earlier mining operations. Your directors have had some unforeseen difficulties to contend with, the most important of which has been the difference of the way in which phosphate has occurred in many of our new pits, and what was formerly thought to be the rule has proved to be the exception, by which I mean to say that one cannot expect in Canadian phosphate mining to be continually coming across large bonanza deposits of apatite, though such do occur from time to time; but that the true calculation is that by moving so many tons of rock one can reckon, on an average, on so many tons of ore. When extracting from large pockets, the phosphate comes out clean and free from impurities; but when the leads narrow down or get intermixed with feldspar, calcite, or mica, the proportion of high testing phosphate will be smaller and much more expensive to cob. We made a good many experiments with this mixed phosphate before we could determine the best method of treating the same, but I am glad to say that we have at last arrived at a process which considerably improves the quality. Had it not been for the large quantity of second and third qualities produced, the profit and loss account would have shown surprisingly different figures.

Turning now to the question of the transport arrangements over which your company has control, I may say that the same are most complete. The tramway at Crown Hill, from cobbing-house to the Du Lièvre River, is a great success for the economic and rapid loading of the scows. On the river we have our own steamer and four scows, and at Buckingham Landing we use steam hoisting apparatus for discharging from the scows into the railway cars. There are certain difficulties at the Little Rapids during the low water in the summer months; but thanks to the excellent arrangements we have been able to make with our neighbours for towage on the river and the loading at Buckingham, we have been able to reduce the anticipated trouble to a minimum; and I take this opportunity of thanking Mr. Hilton Green, of Montreal, and Mr. Walter Pickford, of the High Rock Mine, for joining hands with us over these arrangements. The mill at Buckingham has been steadily grinding the third-class quality, but owing to the excessive production we had considerable quantities ground at the neighbouring mills, and we have just concluded negotiations for a further quantity to be ground over the next 12 months. The demand for this ground phosphate in Canada and the United States is steadily increasing, and we are now getting prices nearly 20 per cent. higher than those of two years ago. I may mention that we had at the mines a large pile of what we call debris, *i.e.*, phosphate mixed with rock in such a shape as to make it impossible to be cobbed, but that we have now been able to turn same to account by the installation of a Blake crusher, and the results are much better than was anticipated, so much so the stock valuation of this pile on November 30 will be increased on realisation by some £800. As regards the general system of work at the mines, there are some alterations that I should very much like to see carried out in the way of more permanent and fixed machinery; but until our financial position is improved your directors cannot see their way to increase the capital expenditure. Your profit and loss account for last year is certainly disappointing, but I may mention that during the first year's working we received about £2,000 under an arrangement made with the former company, and that the freights for last year cost the company nearly £1,000 more than was anticipated. Its was during the months from December, 1888, to June, 1889, that the mining operations were unsuccessful. I calculate that about £3,000 was lost in those six months. The last six month's working, however, made up this loss and showed a few hundred pounds to the good. As regards future prospects, I think the company has all in its favour. The expenses of management have been greatly reduced, and the cost of extraction is considerably lower. The production since December 1 to date has increased about 15 per cent. on the corresponding period of the previous year, and the wages sheet, which is the heaviest item in the accounts, shows a reduction of 10 per cent. In addition to this, I am most pleased to be able to report that the quality of the ore has improved, and we are now getting a higher proportion of first quality, with a corresponding decrease in the production of the mill stuff. This point is really the most important of all, for the mill stuff does not pay the cost of extraction, and on last year's prices there was next to no profit on the second quality, so that it is really the 80 per cent quality which has to earn the dividends. Prices are very materially higher and freights are lower, so that I do not doubt but that this year we shall be able to make some return to the shareholders, who may rest assured that the directors have done, and will continue do do, their best to make the undertaking profitable.

The motion was then put and carried unanimously, without discussion.

Mr. Millar proposed the re-election of Mr. W. H. Williams as director of the company, which was seconded by Mr. Foly and carried.

On the motion of Mr. Winkfield, Messrs. Hibberd, Bull and Co. were re-elected auditors of the company.

Mr. Winkfield then proposed a vote of thanks to the chairman, which was seconded and carried.

The chairman briefly acknowledged the compliment, which closed the meeting.

Meeting of the Excelsior Copper Company (Limited)

At the annual meeting of the Excelsior Copper Company, Limited, held on Tuesday, 22nd ultimo, the chairman, Colonel Malleson, stated that the expenses of the mine amounted to £7,689, while the sum actually realised in England was £1,165, in addition to which they had on the dumps—on the ground—ore estimated at £10,000, the result being a profit of about £3,000. At the conclusion of the chairman's remarks, the secretary, Mr. Fenwick, read the report of Captain Davey, which dealt in an exhaustive manner with the work done at the mine, and subsequently Captain Davey himself addressed the meeting with regard to the present position of the property. During the year he said that they had raised 20,000 tons of schist ore, and from thirteen assays that had been made the lowest yield was 3·90 per cent. and the highest 9 per cent. They had already sent to England about 100,000 tons, which had realised at Swansea from 8 to 9 per cent. They had hundreds of thousands of tons of this schist ore, and he guaranteed what they had on the dumps would give a profit of £10,000. With regard to the better class of ore, he said that would give them 35 to 60 per cent., and they had got that in pockets of 10, 20, 30 and sometimes 50 tons. On the conclusion of the ordinary meeting a special court was held to consider the following resolution, which was carried: —That for the purpose of, and to enable the directors to further develop the property of, the Company, may be, and are hereby, authorized to raise the sum of £20,000 by the issue of debentures secured on the property and plant of the Company, bearing interest at the rate of 7 per cent. per annum, payable half-yearly."

THE CHAIRMAN, answering a question, said the directors had not received £2,054 12s. 2d. for their fees. the amount stated in the balance sheet was an amount put there by the auditors as a matter of account, because the directors were entitled to that amount. During the last seven months, however, the directors had not drawn a single farthing.

A SHAREHOLDER.—What was the money subscribed by the public? I was told it was about £8,000.

THE CHAIRMAN.—It was £8,000.

A SHAREHOLDER.—Seeing that £150,000 was wanted, I think £8,000 is too small a sum for the directors to go to allotment on. (Applause).

THE CHAIRMAN.—I would ask the shareholders to reserve their cheers until I explain to you how the directors were perfectly justified in going into allotment on that sum. Out of an expenditure of £7,689 we have realised an amount which is tantamount to £11,065, and if it had not been for untoward circumstances we should have been in a better position, I am in a position to prove to you and to give you the opinions of experts, that we were perfectly justified in going into allotment on £8,000. I beg to call your attention to that paragraph in the prospectus where the vendor states that he had such confidence in the mine that he was willing to take full payment in shares.

A SHAREHOLDER asked who was the original vendor of the company.

MR. GREENSHIELDS.—I am the original vendor and I shall be pleased to answer any questions you may put. I have not sold one single share. (Applause).

A SHAREHOLDER.—You asked an exorbitant price for the property?

MR. GREENSHIELDS.—That is a matter of opinion. If a dividend had been paid at the beginning of the year, you would not say it was an exorbitant price. These things are to be shown by their results.

THE CHAIRMAN.—I think you do not realise the fact that mining is a speculation. I venture to state you can point to no mine which has been in a better state in the first year of its work than this is. The balance sheet shows it has actually realised more money than has been expended on it.

A SHAREHOLDER.—It has not been realized.

THE CHAIRMAN.—It is virtually realized. The stuff is at the mine.

A SHAREHOLDER.—Can you declare a dividend?

THE CHAIRMAN.—I cannot, but let me tell you one thing. All the directors of this Board are original shareholders. The collective directors hold a larger number of shares, probably, than any other shareholder. Shares which they bought at par value, and which they intend to make worth ten times the amount.

MR. RAWCLIFFE.—May I ask to what circumstances the directors owe this state of affairs?

THE CHAIRMAN.—What state of affairs?

MR. RAWCLIFFE.—Not carrying out the promises in the prospectus.

THE CHAIRMAN.—I will leave Colonel Gay to answer that.

COLONEL GAY said soon after the company was started the price of copper went down very much. It kept on going down. It then became a question as to whether it would be well to go on shipping the ore, or wait for better times. It was thought advisable to go on and get out more copper, with the idea that the price of copper would augment. It did augment to a certain extent, but it never came to the price to pay to send it. If they had more money they could have gone on smelting, and they would have had more copper in England than in Canada. They had no more money, therefore they could not do it.

CAPTAIN DAVEY, in addressing the meeting, said so valuable was the mine that if he had the money he would most gladly purchase. But the shareholders must be sure of this. If they did not choose to work it, those on the other side would, and be only too glad of the chance. It would not remain idle very long. He had seen a great many copper mines, but he had never been struck with a property as he had been with this. (Applause).

THE CHAIRMAN'S motion was then put to the meeting and carried with one dissentient.

The retiring auditors were re-elected.

An extraordinary general meeting was then held for the purpose of considering the following resolution:—

"That for the purpose of and to enable the directors to further develop the property of the company, they be and are hereby authorized to raise the sum of £20,000 by the issue of debentures secured on the property and plant of the company, bearing interest at the rate of 7 per cent. per annum, payable half-yearly."

THE CHAIRMAN said this was a matter on which the future of the mine depended. They wanted money for the development of the mine. He would ask the two gentlemen from Canada to give the meeting the benefit of their opinions.

MR. GREENSHIELDS said that he had visited the mine on two or three occasions, and he was satisfied that with proper and economical working the mine could be made to pay. It was for that reason that he, when the property was put upon the market, accepted and agreed to take, if necessary, his entire consideration price in fully paid up shares. He had not sold any of his shares except the shares he parted with to his friends to provide the working capital for the mine for the last few months. So far as he and his friends were concerned they were ready to subscribe 30,000 or 50,000 shares for the development of the property, because they believed that by the expenditure of more money to strike this ore, which had been spoken of by Captain Davey, they could make the mine a success. He did not wish that this property should fall into the hands of American investors, but that the English shareholders would carry it on and reap the rewards. The property they possessed consisted of some 4,000 acres of land, which covered a valley and two mountains on either side. The range of mountains running through the country was proved to possess large mineral deposits. What they desire to do was to purchase a diamond drill in order to test the property. With that drill they could go down 1,000 feet. They proposed to go to the bottom of the Kent shaft and sink 1,000 feet, and sink another hole at the bottom of the Sayles shaft, which could be done at a comparatively small expense. He had faith in the mine, and believed it would prove a success.

MR. ROOME also expressed his absolute faith in the property. He had, himself, consulted several experts and they had all come to the conclusion that the company had a valuable mine. It was, however, necessary to sink lower and this they intended to do by means of a diamond drill. For there were very rich deposits of ore below, and it was absolutely necessary to get at them

On the motion of the Chairman, seconded by Mr. Greenshields, the resolution was carried with but one dissentient.

The usual vote of thanks brought the meeting to a lose.

c

Iron Ore in Newfoundland.—A correspondent, writing from Bay St. George, Newfoundland, states: "On the south side of this very beautiful bay there is a large and rich deposit of iron ore. It is seven miles and a quarter from a good harbor. It is estimated that there is about a half a million tons in sight which can be mined, or, in fact, quarried at a cost of not over 20 cents per ton. A deep ravine cuttiug through this mountain of ore exposes it on both sides, and affords facilities for its being easily worked. Analysis by Professor Pike shows the ore to contain 65.5 per cent. of metallic iron, equivalent to a composition of pure magnetic iron ore of 70.3 per cent.; silica in the sample showed 5 per cent., and sulphur and phosphorous none, and titanic acid 4 per cent. The proposed railway which is now being constructed to Hall's Bay, on the east coast will, when finished from Hall's Bay to Bay St. George, run within four miles of this mountain of ore. I may further add that coal fields have been discovered in the same neighborhood and are likely to be worked the coming summer. It is high time that the mining resources of this colony were more extensively opened up."

Report of the Commission upon the Mineral Resources of Ontario.

The Commissioners appointed to enquire into and report upon the mineral resources of the Province, and measures for their development, have to state for the information of your Honor, that at their first meeting held in the city of Toronto, after conferring with the members of your Government on the nature and scope of their duties under the terms of the Commission, the following scheme or plan of enquiry was agreed to, viz.:

I. The geology of the Province, with special reference to its economic minerals: assigned to Dr. Bell.

II. Detailed description and maps of the working mines and important undeveloped mineral occurences of the Provinces, together with all matters which appertain to mining engineering: assigned to Mr. Merritt.

III. Trade in mineral products, showing exports and imports, shipping facility for ores, building stones, etc., and a general enquiry into the causes of depression in the mining industry of the country; assigned to the Chairman.

IV. Information and suggestions on the subject of mining laws and regulation, with a view to the giving of greater encouragement to our mining industry: assigned to the Secretary.

V. An enquiry into the best means of promoting the metallurgical industry, with special reference to the smelting of iron and other ores: assigned to the Secretary.

VI. Other measures for the aid and encourgement of the mining and metallurgical industries, embracing: (1) The organization of a bureau of mines for the Province; (2) The founding of a geological and mineralogical museum; (3) The collection and publication of mining statistics; (4) Technical instruction in its relation to mining and metallurgy. The first of these subjects was assigned to Dr. Bell, the second to Mr. Merritt, and the third and fourth to the Secretary.

It was also agreed to as part of the scheme of the report that the evidence of witnesses should be arranged, as far as practicable, under the foregoing heads, so that each subject or section should be complete in itself, and that the distinctive features of the evidence of each witness might appear in their natural and appropriate relation.

Sessions of the Commission for hearing evidence were held at thirty-seven places in the Province, from Ottawa in the east to Rat Portage in the West, and one hundred and sixty-four witnesses were examined under oath, comprising among their number explorers, prospectors, miners, mine and quarry owners, mine captains and superintendents, mine brokers, mining engineers, civil engineers, land surveyors, geologists, assayers, chemists, metallurgists, scientists, iron founders, brick makers, tile, terra cotta and pipe manufacturers, iron makers, copper and nickel smelters, mechanics, lawyers, bankers, merchants, capitalists and speculators. Mines, mining locations and works in the vicinity of places where the Commission met were examined, and careful enquiry respecting them was made.

Several other important districts and places were also visited by members of the Commission, with the object of procuring special or desirable information. The extensive magnetic iron ore range in the region west of Lac-de-milles-lacs and the Black Bay lead region on Lake Superior were explored by Dr. Bell, while Mr. Coe, Mr. Merritt and the Secretary made a journey to the iron ranges in northern Minnesota, near the Ontario boundary. Mr. Merritt also visited the Michigan School of Mines at Houghton. The Chairman and Secretary in the latter part of 1888 visited the Columbia School of Mines in New York, the office of the Geological Survey at Washington, and furnaces and steel works at Pittsburg, Pa., at Chattanooga, Tenn., and at Birmingham, Alabama. Another object of the visit to Birmingham was to enquire into the merits and witness the operation of the Henderson process for eliminating sulphur and phosphorus from iron and converting it into steel. An accident to the machinery prevented their observing this process, but they were fortunate in arranging for a careful test and report upon it to be made by Mr. Garlick, of Cleveland, Ohio, a metallurgist whose experience in the manufacture of iron extends over a period of twenty-five years. His report appears in the Appendix. The secretary also visited, during the summer of 1889, the laboratory of Mr. Edison at Orange, N. J., to witness the operation of an electrical machine invented to purify and concentrate magnetic iron ores, the Sheffield Scientific School at Yale College, and several iron furnaces and mines in the vicinity of Port Henry on Lake Champlain.

The *data* of the report are original and historical. The Commission has not followed in the footsteps of others, but has pursued the course marked out for itself, and it professes to present no inference, opinion or statement of fact which is not warranted by the evidence, the study and observation of its members, or the testimony of the highest authorities.

In the Section devoted to the geology of the Province a systematic account is given of each one of its rock formations. This part of the report could not be prepared

without employing geological terms, but the simplest expressions have been used, and a glossary of many terms has been appended in order that it may be the more easily read by persons unfamiliar with geological science. To make the description more complete and intelligible, it has been deemed necessary to sketch some of the general geological features of North America beyond the borders of Ontario and to touch upon a few of the leading characters in connection with its geology. The aim throughout has been to make a statement of facts only, disregarding everything of a purely theoretical character. This section has been written with the advantages of a full knowledge of the work of the Canadian Geological Survey from its inception up to the present time, and it embodies the results of the latest researches not only of members of that service but of various other investigators. In its preparation advantage has also been taken of any new or hitherto unpublished information known to the writer.

The reports of the Geological Survey of Canada, although of much value for reference as to details in the various Provinces, are too numerous and too voluminous for the use of any one who can spare only time to acquire a general acquaintance with the geology of his own Province. Moreover, as these reports extend back through a period of nearly half a century, most of them are inaccessible to the public, and much of what was stated in the earlier volumes has been superseded, modified or largely supplemented by more recent investigations. The limits of the Province having been recently extended far beyond those which were formerly recognized, any previous account of its geology would now be incomplete, even if the *data* in reference to the added territory had been available. But no pretence is made to cover the field in this work. A full account of every branch of the subject, or of any locality, has not been attempted ; that would occupy several volumes, and the aim of the Commission has been to present in compact form information upon all matters coming within the scope of its enquiry. The Geological Section, however, embraces the most recent and the best established views on all points, and gives prominence to the Archæan rocks, which cover the greater part of Ontario as now bounded, and which are important from the occurrence in them of various economic minerals in the Huronian and Upper Laurentian systems. The description of the various formations of the Cambrian, Silurian and Devonian systems is briefer, the fullest account being reserved for those which are richest in mineral,. Such are the Animikie, yielding silver ore ; the Nipigon, in which native copper occurs ; the Trenton, which produces petroleum and natural gas ; and the Onondaga, which holds the beds of salt and gypsum.

The classification of rocks which has been followed is that of the late Sir William Logan, the accomplished founder and for twenty-seven years the director of the Geological Survey of Canada. The geology of the mining districts is described in greater detail than that of other parts of the Province, and the geological relations of some of the principal mineral products are given as examples to illustrate their general character in the districts referred to. Additional facts on these subjects are mentioned in the section on mines, especially on the occurrence of iron ores and phosphate of lime in the eastern part of the Province, and much new information available for these purposes has been collected by the Commission or supplied by the testimony of witnesses. A supplementary account of the geology of the Sudbury district and of the mining operations there, brought down to the month of October, 1889, is given in the Appendix.

A practical business basis has now been reached in the development of a number of our minerals, as for example in the production of salt, petroleum, phosphate, mica, cement, gypsum and building stones, and in the manufacture of bricks, terra cotta, tile and sewer pipe. The silver and copper and nickle mines are also being worked with much skill and energy, and at the few locations where deep shafts have been sunk and galleries have been driven the existence of large ore bodies has been demonstrated. Iron mining has been intermittent hitherto, but its operations will doubtless assume a permanent place as a source of one of our largest mineral products when we shall have the steady demand of a home market to provide for, beside such foreign markets as we may be able to secure. It may also be confidently hoped that gold mining will become one of the established industries of the country, especially if attention be given to our refractory ores and should the economic treatment of them be satisfactorily solved.

The cost of mining machinery, much of which is not yet made in Canada, is a matter of common complaint with mine owners, as is also the high freight charges on machinery, supplies and ore ; but these are losses of advantage which the enlightened good sense and liberality of our Governments and our railway companies may be expected to overcome. In no other way can a country add more directly to its wealth than by raising and utilising its minerals, assuming it to possess them in commercial quantities ; for not only are manufacturing industries of many kinds created to treat them, but the raw material may itself be said to be created by the labor expended in searching for and mining it. Whatever lessons the cost of raising minerals and whatever facilities their shipment to the best markets are the most obvious means of aiding the industry ; and in so far as governments can remove burdens imposed on themselves, or reduce the cost of carriage by building or granting aid to build roads or railways, they to that extent make the success of mining operations possible.

Explorers and prospectors are the pioneers of mining enterprise. They have already proven that our Province contains almost all of the economic minerals in workable quantities except coal, and that it has vast possibilities of mineral wealth. Yet the tolls upon trade and the want of facilities for cheap transportation are a hindrance so serious to the employment of capital that a number of the most promising of known mineral properties are either lying idle or are being worked in the face of great odds. Encouragement of the industry, not its discouragement, is the office and duty of the governments. Explorers, prospectors and miners deserve just consideration and liberal treatment. Mineral lands should be held for development, not for speculation. Mining enterprises should not be weighted with restrictions imposed by trade policies, and should as far as possible consistently with a fair consideration of the claims of all other interests of our country be secured the advantages of the home markets. Confidence in mining as a business should be established by yearly reports of progress made and work done. To instruct, to inform, to ascertain and publish facts, to lighten the industry, to enlighten the men employed in it and deal with them in a generous spirit—such, in the opinion of the Commissioners, is the true national policy for governments to pursue in promoting the development of our mineral resources.

The evidence that Ontario possesses great mineral wealth is abundant, and is constantly accumulating. In the central and eastern counties are magnetic and hematitic iron ores, gold, galena, plumbago, arsenic, mica, fibrous sepentine, apatite, granite, marble and freestone. In the Sudbury district copper and nickel mines are being worked on a large scale. In the township of Denison rich specimens of gold-bearing quartz and extensive deposits of copper and nickel are found. Along the north shore of Lake Huron, from the mouth of the French river to Sault Ste. Marie, gold and silver-bearing veins, iron, copper, galena and immense quarries of marble have been discovered. North of the height of land and extending towards James Bay prospectors report a promising mineral region. North of Lake Superior locations of gold, silver, copper, iron, galena, plumbago and zinc ores have been taken up, besides which there are inexhaustible supplies of granite, marble, serpentine and sandstone. West of Port Arthur is a silver district which, judging from the explorations already made, promises to be an argentiferous region of great richness. Beyond this district, to the northwest, are found veins of gold-bearing quartz and extensive ranges of magnetic iron ore, while to the southwest is believed to be a continuation of the Vermillion iron range of northern Minnesota. The partial examination already made inspires the hope that here will in time be developed an iron region of great value. Upon Sultana island and other islands in the Lake-of-the-Woods, and in the region adjacent to that lake, gold-bearing veins of good promise have been discovered, and now that the question of title has been settled an early development of some of the properties may be looked for. But knowledge of the extent of our resources is necessarily imperfect. The area of the Province is vast, many districts have not been prospected at all, and therefore it may be reasonably presumed that only an inconsiderable portion of our mineral wealth is yet known to us.

But notwithstanding the extent and variety of our mineral resources, the statistics and tables presented in Section III show conclusively that in Ontario as well as elsewhere in the Dominion the mining industry is making slow progress. The value of the metallic and non-metallic mineral products of Canada for 1887 was $11,-896,793, whereas the value of the same class of products in the United States in that year was $542,284,225, being nearly four times greater in the latter than in the former country per head of population.*

The United States is the principal customer of Canada for products of the mine, the value of our exports to that country for the seven fiscal years 1881 to 1887 being $18,567,710, while to all the rest of the world it was only $4,828,313. The value of the mineral exports of Ontario alone to the United States for the twenty fiscal years 1869 to 1888 was $14,329,330, and to all the rest of the world it was $3,342,894. These figures present in a striking light the natural commercial affinity which exists between the two great Anglo-Saxon divisions of the continent, and open a field of speculative enquiry as to what might have been the volume of the business if trade restrictions had not clogged its movement. The great store of ores and structural materials possessed by Canada and the transportation facilities by land and water for placing them upon the markets of the United States could not fail to build up a trade of immense extent in mine and quarry products but for the duties which have served in a more or less perfect degree the purpose of preventing commercial intercourse.

Everywhere among men interested in mining operations, with the exception of those engaged in producing and refining petroleum, the Commissioners have met with expressions of an earnest desire to see the American markets opened to the admission of Canadian minerals free of duty upon terms equally fair to both countries. The amount of iron ore exported from Canada for the fiscal year 1888 was 13,544 tons, valued at $39,595, all but ten tons of which was mined in Ontario and exported to the United States. For the calendar year 1888 the shipment of iron ore from the lake Superior mines of Michigan, Wisconsin, and Minnesota to lake Erie ports amounted to 5,023,279 long tons, or three hundred and seventy-five times as much as the entire export from Canada. This ore was worth $15,000,000 at the ports of shipment ; about $6,000,000 was earned by the lake marine in its transportation to lake Erie ports, and a large but unknown amount by the railway companies over whose lines it was carried to furnaces at Pittsburg and eleswhere. For the calendar year 1889 the total output of the lake Superior mines was 7,292,754 tons, showing an increase in ten years of 5,917,063 tons, or 430 per cent. Ontario undoubtedly possesses large quantities of iron ore that might be delivered at all the furnaces of Ohio, Pennsylvania and New York as cheaply except for the duty as the ores of lake Superior, but her mines are almost absolutely idle.

The increase in the world's production of iron from 1800 to 1888 has been nearly thirty-fold, it having grown from 825,000 tons in the former to 23,194,500 tons in the latter year. Of the product of 1888 Great Britain furnished 34 per cent. and the United States 28 per cent. The world's product of steel for the same year was 9,630,477 tons, and of this amount Great Britain furnished 35½ per cent. and the United States 30 per cent. Yet in the vast movement of industrial forces connected with the manufacture of iron and steel, over three-fifths of which centres in Great Britain and the United States, Canada has relatively an insignificant part, its total amount of wrought and puddled iron in the calendar year 1887 being only 31,501 tons and of steel 7,326 tons, while its make of pig iron in the fiscal year 1888-9 was only 24,822 tons.

Our situation naturally suggests comparison between ourselves and our neighbors, and when we observe the rapid increase of mineral development in the United States, the great stream of capital flowing in upon the mining districts of the north and south, and the transformation of regions but lately almost uninhabited into scenes of industrial activity, the conclusion seems to be irresistible that if we could succeed in directing enterprise to our own mineral districts results of like kind would surely follow. More than one-half of the capital now invested in the mines and mineral properties of this Province is held by Americans, in spite of the repellent conditions imposed by trade policies upon both sides, and the extent to which it might further be attracted may be conceived by observing the growth of the industry in neighboring States.

The numerous complaints heard by the Commission respecting the mining laws of the province made a careful enquiry into that subject necessary, and in addition to the information given and the suggestions offered by many witnesses the mining laws and regulations of the principal countries of the world have been examined and digests of them prepared, so that our own laws might be considered in the light of a wide experience. It does not appear to your Commissioners, however, that very radical changes are demanded. The provisions of the Act which relate to "mining claims" are found by experience to be unsuited to the occurrence of minerals in this province, where no alluvial deposits of minerals are known to exist, and it does not appear that any properties are being secured under them. It is only in the provisions which relate to "mining locations" that changes in the law are felt to be desirable.

The custom of terming a mining location a mine is itself misleading and mischievous, and unfortunately the terms are synonymous as defined by the Act. Mining men and capitalists have not infrequently met with disappointment in this province by being brought to see a "mine" which has turned out to be only an undeveloped location, and to prevent the recurrence of such mistakes it is desirable that the term should be clearly and accurately defined.

The prospector and the explorer have special claims for consideration at the hands of the Government, for without their services many years may elapse before the

*The table of the Canadian Geological Survey includes in the list of mineral products such articles as brick, charcoal, coke, fertilisers, glass and glassware, iron, iron ore, pottery ware, sewer pipe and tile, steel, sulphuric acid, terra cotta and tile, but as these are not embraced in the United States table their value is struck out of the Canadian total so that a fair comparison may be made. The statistics of 1888 show that the value of the metallic and non-metallic mineral products of Canada in that year was $12,048,421, and of the United States $584,550,676, being for the former country $151,628 and for the latter $42,266,451 more than the value of their respective products in 1887. See Appendix N.

mineral riches of the country are made known. They should have easy access to sources of information; geological and topographical maps of the territory they propose to examine should be placed in their hands if available; records of every transaction in mining locations should be open to their inspection, and they should be permitted to file and prove claims at the local agencies. The right of staking out claims might also be conceded in unsurveyed districts, under proper regulations. But in all cases it is desirable that proof of discovery of a mineral vein or deposit within the limits of the location applied for shonld be furnished before a claim is filed.

The extent and number of locations which one person or company may claim or hold cannot easily be regulated in practice, and while in all cases the tenure of mineral lands should be subject to working conditions, it does not seem to your Commissioners that a wise or useful purpose can be served by a provision the effect of which would be to bar the profitable investment of capital. One strong company, if not hindered by a too narrow area, may employ more men and raise more minerals than half a dozen weaker concerns. But prospectors, explorers and miners deserve to be encouraged in the acquisition of locations of small area, and if their conveniences are better suited with the privilege of buying forty or even twenty acres instead of the present minimum of eighty acres, subject to working conditions, the country stands to gain rather than to lose by the sale of the smaller area.

The Commissioners have been impressed with the danger which threatens one of the chief sources of revenue possessed by the Province in prospecting for minerals. They were struck with the appearance of many scenes of desolation where forest fires had swept over wide districts, leaving blackened tree trunks and fire-scorched wastes in the place of hills and valleys once covered with valuable timber. The loss to the Province from this cause has reached many millions of dollars within the last thirty years, and constant danger of further disaster attends the business of prospecting for minerals in forest regions. Moss and leaves often conceal mineral veins, and in addition to the danger arising from carelessness there is reason to believe that unscrupulous persons sometimes set out fires and burn valuable tracts of timber-land merely to facilitate their own work of search for minerals; and still oftener fires are started by the carelessness and even recklessness of sportsmen, tourists, missionaries, surveyors and others. This new danger to our forest wealth is one which may well engage the attention of the Government and the Legislature, and perhaps there is no simpler plan of keeping a check upon prospectors and explorers than to require each one to take out a license at the nearest land office, upon payment of a nominal fee, granting him permission to search for minerals within a district of defined boundaries.

The Act contains no provision for the health and safety of miners, and although no law can ensure workmen against the occurrence of accidents or the effects of foul air, it is none the less necessary that every possible precaution for their health and safety should be taken. Neither is there any provision for the recovery of claims against employers, such as is found in the mining Laws of many other countries, but it may be that the general statutes afford sufficient facilities to mine-workers in the collection of wages without special provision being made to suit their particular circumstances.

The mining industry may be carried on in a country, as it is in many sections of countries, without the smelting of metallic ores being undertaken. Great Britain imports large quantities of iron ores for her furnaces from Spain, Elba, Sweden and elsewhere, and almost the whole of the iron ores raised in the mines of the lake Superior ranges are shipped to furnaces in Chicago, Detroit, Cleveland, Pittsburg and other centres of iron-making in the United States. This practice has the advantage of enabling iron masters to make mixtures of ores suitable for free smelting, as well as to produce the various grades of iron required by the manufacturers. But wherever the conditions are favorable, mining and smelting may be carried on most advantageously as the complements of each other. If sufficient supplies of fuel, flux and a suitable quality of ore are found close together the best location for a furnace is at the mine, especially if there are facilities for shipping the product to market. It is unquestionably in a country's interest not only to smelt its own ores, but to refine and manufacture the metals providing always that the various operations can be carried on economically and without taxing other interests indefinitely for their maintenance.

The history of the iron industry in Great Britain proves conclusively that its growth and prosperity have depended upon a knowledge of methods and processes. Towards the middle of the last century, before mineral fuel began to be used in blast furnaces, the total yearly make of pig iron in that country did not equal the production of one furnace of medium capacity at the present day. The industry was threatened with extinction, from which it was saved by the genius of Abraham Darby, who discovered the means of using bituminous coal as furnace fuel by converting it into coke. He worked out the problem in the sweat of a sleepless brain, and the narrative of his achievement is one of the most touching in the long story of the triumphs of man over matter. Darby's discovery was the beginning of Britain's career as the chief iron producing and iron manufacturing country of the world, and she owes that position to the service of processes and appliances begotten by the ingenuity of her sons. The cylindrical bellows of Smeaton, the steam-engine of Watt, the pudding process and the puddle rolls of Cort, the hot blast of Neilson, the steam hammer of Nasmyth, the various processes of Huntsman, Heath, Bessemer, Mushet, Siemens and others for the conversion of iron into steel, the utilisation of furnace gases and the improvements in furnace construction, mark every step in the progressive stages of the industry along its wonderful course. And it is mainly upon a knowledge of processes and skill in the use of them, conjoined with capital and prudent enterprise, that we must rely if a prosperous and stable iron industry is ever to be established in this country. We may begin with the best appliances, and with skill and capital we can start upon even terms with the iron men of the United States and Great Britain. But we should begin right—with experienced management, the best working plant, a sufficiency of capital, and not unmindful of the wants of the home market or our trade relations with other countries. The industry is of first class importance, and every proper means should be taken to secure its establishment in Ontario.

The course which a wise policy would naturally suggest is, to begin with whatever branch of the industry promises to give the largest profits and surest results. We have neither anthracite nor bituminous coal, and if one or other of these fuels were used it would require to be hauled long distances at a charge for freight dependent on our ability to furnish return cargoes. Besides, the margin of profit on coke and anthracite iron is never large, and the price is subject to frequent fluctuations as a consequence of the great capacity of British and American furnaces to produce supplies. With charcoal iron the case is different. The supply is limited, the demand is usually constant, superior quality causes it to be indispensable for certain purposes, and where ore, fuel and flux are found in proximity the margin of profit may be regarded as fairly liberal. From data presented in Section v, some of which have been furnished by metallurgists and others by iron masters or the managers of furnaces, it appears that the cost of producing charcoal iron in Ontario would be about $13·60 per long ton, the figures of ten estimates ranging from $9.08 for a hot blast furnace of 60 tons daily capacity to $18.50 for one of five tons capacity. There is no charcoal iron made in Ontario however, and all that is required for the manufacture of malleable castings is imported from the United States at a cost ranging from $26 to $38 per long ton according to quality—freight and duty paid. These prices ought to be considered as affording a liberal margin of profit on the cost of production, especially when the statement is made upon expert authority that a furnace of 9,000 tons yearly capacity would earn ten per cent. on a capital of $200,000 at a profit of $2.25 per ton of pig iron produced. Furnaces located at favorable points should be able to supply the home market with all the charcoal iron it wants, and, besides, keep out much of the poorer coke iron imported from other countries. The iron masters might even hope to make sales at good prices in the British and American markets, notwithstanding the freight charges on shipments to the one and the high duties which guard entrance to the other.

The most promising mineral works in the Province at present are the mining and smelting of copper and nickel ores in the vicinity of Sudbury. The Canadian Copper company began operations there in the latter part of 1886 and shafts were sunk on three separate locations, one of which had reached a depth of over 500 feet at the close of 1889. The ore body is proven to be very extensive, and large quantities have been raised at each of the mines. One water-jacketed furnace was set up by this company in 1888 and a second in 1889. Each has a capacity of smelttng 120 tons of roasted ore per day, producing a matte which carries about 13 per cent. of nickel and 18 per cent. of copper. Computed upon the basis of work in 1889, the annual yield will average 500 tons of refined nicked and 700 tons of refined copper per furnace, and for nicked alone this represents a market value of $500,000. During 1889 mining operations were commenced in the same district by the Dominion Mineral company of Montreal and Vivian & Co. of Swansea, Wales, the latter being owners of the largest copper smelting and refining works in the would. It is understood that furnaces are being erected by these companies at their respective mines, and that smelting operations will begin at an early day.

The experiments recently carried on in England and Scotland with alloys of nickel and steel, to which reference is made in section v, cause great interest to be attached to Ontario's deposits of nickeliferous ores. If the results already obtained are verified by further tests, and if the claims made for the alloys are fully borne out by practical application in the metallic arts, the importance of the inventions to this Province can hardly be over-estimated. The ranges already discovered in the region north of Georgian Bay are more extensive than any which have been found elsewhere, and only a small portion of the formation carrying nickel and copper ores has yet been explored. It does not appear unlikely, indeed, that in spite of its unattractive aspect this may prove to be the most valuable portion of territory in the whole of Ontario, and your Commissioners venture to recommend to your Government the importance of carefully investigating its resources and encouraging by every legitimate means their development. The construction of new railway lines may be found necessary for opening new locations; and possibly a practicable scheme can be devised whereby not only the smelting of ores may be carried on upon a large scale, but also that the matte may be refined in the country instead of shipping it to distant places, and that our rich magnetic ores may be utilized in the manufacture of nickel steel.

In order that the mineral resources of the Province may be successfully and economically developed it is desirable that measures should be taken for the practical and scientific training of all who may engage in the industry. Prospectors and explorers are found to be very deficient in the kind of information which would enable them to prosecute their arduous labors to the best advantage, and your Commissioners recommend for that purpose the adoption of a scheme such as has been tried with gratifying results in the colony of New Zealand, and fully explained in Appendix L. But for the education of mining engineers and metallurgists a thorough system of instruction is called for, which can only be provided by establishing a School of Mines or enlarging the course of studies at the School of Practical Science in connection with the Provincial University. It is the opinion of your Commissioners that if the duty of providing instruction of this character devolves upon the Government the obvious plan is to take advantage of the means which are available in the University courses of study, and to make such additions of instructors and appliances as may be necessary for a thorough equipment. And for economic and educational purposes of the first importance your Commissioners further recommend the establishing of a bureau of mines for the purpose of making a complete geological survey of the Province, and a museum of geology and mineralogy to represent its rock formations, minerals and metallurgical products, together with an efficient plan for the collection of yearly statistics of the mining and metallurgical industries of the Province, as indicated in Section VI. of their report herewith respectfully submitted for Your Honor's consideration.

Signed John Charlton, Chairman; Robert Bell, William Coe, Wm. Hamilton Merritt, Archibald Blue, Secretary.

Toronto, April, 1890.

Note on the occurrence of Native Copper in the Animikie rocks of Thunder Bay.

By Andrew C. Lawson, Ottawa, Ont.

Among the rock formations of lake Superior, the Keweenawan or Nipigon series has long been recognized as strongly characterized and differentiated from older and newer rocks, by the occurrence of deposits of native copper. So distinctive have these features appeared that a common synonym for the series is "The copper-bearing rocks." No occurrence of native copper in the Animikie rocks has, so far as the author is aware, been recorded. Any facts therefore, which indicate that native copper is not peculiar to the Keweenawan series, but occurs under somewhat analogous conditions in association with the Animikie rocks, which underlie it, will be received with interest both by geologists and miners familiar with Lake Superior. Such facts have come under the notice of the writer during the past season, and it is here proposed to give a brief account of them since it will be some considerable time before a systematic report of the geology of the region can be published.

Field occurrence:—Along the west side of S. W. ¼ Sec. 8. Con. VI. in the township of Blake, District of Thunder Bay, runs a north and south trending ridge which presents an abrupt escarpment about two hundred feet high facing the east. To the west of the brink of the escarpment the surface slopes gradually to the old Pigeon River road. The section exposed in the face of the escarpment is very characteristic of all the numerous similar escarpments of this portion of the country and consists of about 150 ft. of nearly flat lying black shales and thin gray siliceous beds of the Animikie series, capped by about 50 ft. of vertically columnar diabase trap. Near the south end of the quarter section, there is an indentation or bay in the face of the escarpment affording a steep slope whereby it may be ascended from the valley to the east. At the foot of this slope some Indian prospectors found some pieces of amygdaloidal trap carrying native copper, which were brought to my notice at Port Arthur by Mr. C. Johnson, who had become interested in the find. In company with Mr. Johnson and his Indian guide I visited the ground last October, and

found extending up the surface of this slope a dyke-like ridge of cupriferous amygdaloid. The surface had not been stripped, but was covered with soil, forest loam, brush, tree roots and moss. There were, however, four or five outcrops along the ridge from the bottom of the slope up to an elevation of 100 ft. These lay in a line which, by the compass, had a bearing of N. E. and S. W., which is the strike of the deposit provided it be a vertical attitude; but this question cannot be determined till farther stripping and exploring has been done. If the deposit has a dip or lode, the true strike, which is of importance as a guide to further exploration, would have some other direction than N. E. and S. W. The outcrops show very clearly a width of at least 15 to 20 ft., though nowhere is the contact with the country rock exposed. The trap has a much more pronounced amygdaloidal structure at the base of the slope than higher up, but does not carry so much visible copper. The whole appearence is that of a dyke filling a fissure in the Animikie strata. Whether the amygdaloidal trap cuts the diabase trap cap which rests on the shales, cannot at present be determined. It probably does not.

There are, however, some circumstances which, in view of the meagreness of the exposures, render other explanations possible, and the conclusion that the formation is a dyke can only be held tentatively. These are (1) that at a level of 100 ft. up the slope there is a small outcrop of a fine-grained, brownish red sandstone such as is common in the Keweenawan series. but which has nowhere been observed by the writer in the Animikie; (2) dykes do not usually present a highly vesicular or amygdaloidal structure which is rather the characteristic of surface flows; (3) the supposed dykes are much more vesicular and the vesicules are larger at the foot of the sloping line of outcrop than at the top, which is contrary to what we would expect with reference to the formation of vesicules in any molten mass of rock, the mass being usually more vesicular toward the top where the pressure is less. The other possible explanations, none of which are supported by any direct field evidence, are (1) that the supposed dyke may be a small piece which has been let down within the Animikie by faulting from the Nipigon, which may be supposed to have once covered the Animikie here as it does elsewhere; or (2) it may be the infilling of a fissure in the Animikie formation from above by a surface flow of vesicular lava which brought down with it portions of the Nipigon sandstone; or (3), least likely of all, it may be a small outlying patch of the Nipigon resting on the surface of a pre-existing slope of the Animikie.

A little exploration and mining would soon set at rest these questions as to the precise nature of the formation. We have this fact at least, that it is a rock of the same facies as the amygdaloids of the Keweenawan or Nipigon similarly charged with copper, well within the Animikie slates and apparently cutting them. In this respect the formation differs from the amygdaloides of the Keeweenawan, which are interbedded and contemporaneous with the other rocks of that age, while the formation here discussed is apparently of later age than the Animikie, and may very probably be of Keweenawan age, though associated with Animikie rocks.

Character of the Rock.—The rock in which the copper occurs is a fine textured purplish-brown trap strongly amygdaloidal in some portions and only feebly so in others. The least amygdaloidal portions when examined in thin section prove to be typical diabase. Slender idiomorphic plagioclase crystals lie embedded in allotriomorphic masses of purplish to yellowish gray augite and in yellowish green masses of chlorite which is doubtless the result of the alteration of the augite. Yellowish brown iron oxide partly opaque and partly translucent occurs in profusely scattered grains.

The more amygdaloidal portions show in thin sections a finer textnre but an equally strongly pronounced ophitic structurc. Augite is not so abundant and plagioclase is the dominant mineral. A portion of the base appears to be glass, being colourless and isotrophic; and the augite is probably represented in part by the glass and in part by certain decomposition products interstitial between the feldspars. Magnetite and brown iron oxide are generally distributed. The crystals of plagioclase are arranged tangentially to the periphery of the amygdaloidal cavities. The latter are filled with calcite or dolomite and a brightly polarizing fibrous or lamellar mineral doubtless a zeolite. In the thin section examined no copper was detected, but microscopically it may be seen scattered through the rock in small grains which do not appear to fill up the round vesicles, but to be more irregular in shape.

The brown red sandstone above referred to is very fine textured and could not be identified as a sandstone with certainty in the field. In this section it is seen to consist of an aggregate of rounded, pear-shaped and angular grains of feldspar, pyroxene, chlorite and quartz, all the grains having a coating of iron oxide. A good deal of the secondary matrix appears to be feldspar, probably albite and orthoclase, and it is full of slender colourless needle-like microlites. Twinning lamellæ of the secondary feldspar are in some cases distinct, but for the most part are not apparent. Some of the rounded clastic grains of feldspar show feeble traces of secondary growth.

Proportion of Copper.—A few specimens of the rock were collected with the view of ascertaining its average value as a copper ore. Four of these have been submitted to Mr. F. L. Sperry, chemist to the Canadian Copper Co., at Sudbury, who has very kindly analyzed them. These specimens taken from different parts of the outcrop at an elevation of 64 feet above the foot of the slope, and one from the lowest outcrop gave the following percentages of copper:—

Sample No. 1, 64 feet level	1.32%	Copper.
" No. 2, lowest outcrop	0.27%	"
" No. 3, 64 feet level	2.88%	"
" No. 4, " "	3.57%	"

Besides this occurrence the writer was also shown other specimens of amygdaloidal trap carrying native copper, which were said to come from the township of Crooks; but although the locality was carefully examined the deposit could not be found as the services of the guide who knew its whereabouts could not be secured. Later in the season Mr. Hille, mining engineer of Port Arthur, secured the necessary guide and proceeded to the place where these specimens were taken, and he has since informed the writer that he succeeded in locating a dyke-like formation of amygdaloidal trap carrying copper in sec. 4, con. II of Crooks. But enough has been advanced to show that the Animikie rocks of Thunder Bay are worth careful prospecting for copper.

Peculiar Working of a Blast-Furnace.*

By N. G. Wittman, Birdsboro, Pa.

The working of blast-furnaces is always of interest to many members of the Institute, for which reason I present an account of the working of the furnaces of the E. and G. Brooke Iron Company, of which I have had charge for the past four years. Although there are no phenomenal runs to record, there have been long periods of satisfactory work, and also periods—altogether too long—when one of our furnaces has behaved in a way which may be described as "nagging." All the conditions were apparently normal, but only a very light burden could be carried, which of course resulted in a high fuel consumption to the ton of iron, as well as increased cost of labor.

The two active furnaces of this company have the following dimensions and equipment:

	No. 2. Feet.	No. 3. Feet.
Height	55	60
Diameter at Bosh	15	16
" hearth	8	7½
" stock-line	10	9½
Height of bosh	23	23
" tuyeres	5½	5
Diameter of bell	7	6
Front	closed	open

Both furnaces are blown with I. P. Morris condensing engines, similar in all respects save one, the engine of No. 2 having a steam cylinder of 45 inches diameter, while that of No. 3 is 50 inches. In both the diameter of the air cylinder is 90 inches, and the stroke 84 inches.

In both cases the stock is raised by an air-hoist.

In No. 2 the blast is heated by three Durham stoves of 28 pipes each, the pipes being 14 feet high and 8 inches inside diameter. No. 3 has two Kent ovens, 40 pipes in each, 14 feet high by 7 inches inside diameter.

The ore mixture, which is practicrlly the same for both furnaces, consists of 75 per cent. magnetites and 25 per cent. Lake Superior or foreign hematites.

About 40 per cent. of the magnetic ore is similar in character to that of Cornwall, except that it carries a variable amount of free calcite, ranging from nothing to 8 per cent. The sulphur in it is also very inconstant, the extreme range being from 1 to 4½ per cent., probably an average of about 2½ per cent. There appears to be no definite relation between the percentage of free calcite and sulphur, the latter being in the form of pyrites, agglomerated with the ore, while the former occurs in loose pieces, varying in size from grains of sand to masses weighing several pounds.

The general gangue of the ore is hornblende, with which the calcite is sometimes associated intimately, as it seldom is with the ore.

This ore is the only one used which is inherently troublesome to work.

The points of difficulty are, that the calcite being variable, it is impossible to flux it with any degree of certainty as to the composition of the cinder, and that a large portion of the sulphur is oxidized to sulphuric acid, and combines with the lime, forming calcic sulphate or gypsum, so that it is only practicable to reduce the sulphur about one-half by roasting.

The ore disintegrates very rapidly, and there are several soft veins in the mine, so that a considerable portion of it is fine, like sand.

It is a well known fact that an ore carrying sulphur in material quantity, cools the hearth of the furnace, probably by dissociation of calcite sulphate, and "buckshot" results, while the hearth is "built up."

The fuel used is anthracite, with as much coke (usually from 20 to 30 per cent. of the fuel charge) as the price of coke will permit.

Dolomite of very uniform composition is used as a flux, for the reason that no calcite of good quality is available.

About 1·8 tons of ore are required to the ton of iron, and 0·8 ton of stone is added to form a cinder of approximately 35 SiO_2, 12 Al_2O_3, 33 CaO and CaS, and 20 MgO.

As an instance of satisfactory work may be cited the record of furnace No. 3 for nine consecutive months, during which time 18,422 tons of iron were made, being an average of 472·36 tons weekly, on a fuel consumption of 1·19 tons to the ton of iron. The best week's output was 531 tons, made with 1·05 tons of fuel per ton of iron.

This furnace was filled and blown in as follows: Three stands of oak wood were put above the tuyeres, and the hearth was packed full of light dry pine, saturated with oil. On top of the wood was put, as a blank, 26 tons of coke, with about 2 tons of good gray furnace-cinder to flux the ash of the coke and wood. Ore-charges were then commenced with 2,000 pounds fuel (½ anthracite and ½ coke), 1,300 pounds ore, and stone calculated to form a slag of 39 per cent. SiO_2. The burden was increased 200 pounds every six charges, until the stack was full, after which the fuel-charge was 66⅔ per cent. anthracite and 33⅓ per cent. coke. The furnace was lighted at the tapping-hole and tuyeres. The wood burned well, and as soon as bright coke appeared at the tuyeres the blast was put on, and everything went off smoothly. The volume of blast was increased so that in ten days the maximum was attained. This furnace continued in blast over three years; had all sorts of mishaps, due to break-downs in machinery, which necessitated long stoppages without preparation; yet always worked without trouble, and, for the greater part of the time, with very satisfactory economy in fuel. It will be remembered that the lines of this furnace are by no means modern.

Furnace No. 2 was blown in, as nearly as possible, in exactly the same way, and went off equally well; but the work for the first nine months of the blast—which is the present one—was vastly different.

The general features of the process were normal; the stock settled evenly all around; tuyeres bright; gas good and plentiful; cinder hot and of proper basicity; but there was no indication that a heavier burden could be carried. The charge at the time of blowing-in was: fuel, 2,000 pounds; ore, 2,600 pounds; stone, 1,240 pounds. After a few days an attempt was made to add more burden, although the iron was only an ordinary gray-forge; but after the additional ore—60 pounds—came to work, the iron was closer in grain, and evidence was soon given that the furnace was overburdened. The only abnormal feature was low pressure of blast, the gauge registering only 4½ pounds per square inch for two or three weeks after blowing-in, and gradually rising to 5½ pounds, where it remained for about three months. The usual pressure with ¾ anthracite and ¼ coke (the fuel-mixture then in use) is 7 to 8 pounds, and the low pressure indicated the possibility of working up the center, or "ring-scaffolding." To ascertain whether this was the case, and at the same time endeavor to correct it, a fuel-blank of 20 tons was charged, with scrap enough to keep the iron from becoming too gray.

When this had been in the furnace about ten hours, the speed of the engine was reduced three revolutions, so that there might be a tendency of the blast to work up the walls and loosen any matter which adhered to them, and get it into the hearth about the time the extra fuel reached there. The presence of the blank in the melting-zone was manifested by the cinder in about twenty hours after it was charged at the tunnel-head, and after 60 charges or rounds had been put in on top of it (the volume of which would occupy the space between the stock-line and bosh), showing that the melting-zone was in the region of the bosh, and that no considerable accumulations were on the walls. The working of the furnace was not at all improved by the blank, or changed in any way that was perceptible. During the time from blowing-in, November, 1888, to March, 1889, the best week's work was 445 tons of iron of 1.3 tons of fuel per ton of iron, and the average production for five consecutive weeks was 431 tons, requiring 1.3 tons of fuel per ton of iron. The pressure still continued low. After some time it was discovered that the collars connecting the pipes in the mains in the hot-blast stoves had "raised" in all the ovens, and that several of them were split, so that it became necessary to give them a thorough overhauling, which occupied the greater portion of three weeks. While these repairs were being made two ovens were used, and the volume of blast had to be diminished in order to keep up its temperature. It may be mentioned here, as a tale of misfortune, that when one oven was off, and about twelve hours before it could be ready for service, a violent rain storm occurred; a water-

* Washington meeting of American Institute of Mining Engineers.

conductor, which passed over one of the ovens, became disconnected at a joint, and the water poured on the roof of the oven and found its way between two plates, which had warped somewhat, in a sufficient quantity to crack a piece out of one of the pipes. The piece was large enough to cause the hot-blast valve to drop, and, the furnace being full of cinder at the time, the belly-pipes, all filled. This necessitated a stop of about four hours to clean them out, after which we were obliged to run twelve hours with one oven of twenty-eight pipes and a blast-temperature of 600°. Finally, the ovens were all in good shape again, and some improvement was noted in the working over that immediately preceding the time when repairs were commenced, but not nearly so much as I had hoped for. The pressure had gradually risen to 7 pounds, but the fuel-consumption per ton of iron remained high, and it was not long until the production fell off to less than before repairs were made, and the fuel rose to still higher figures. The pressure remained at 7 to 7½ pounds per square inch.

During the months of July and August the results were most discouraging. The average production for five weeks during that time was 361-8 tons, each requiring 1.508 tons, of fuel. The worst week's work was: iron, 356 tons; fuel-rate, 1.6 tons.

The only abnormal feature apparent was that, during casting, the cinder would run out very hot and fluid, separating perfectly from the iron, until about one-third of it had run; then a mass of "buckshot" would follow, often choking under the skimmer, and causing iron to run out into the cinder-runners. This was followed by about an equal amount of hot, fluid cinder entirely free from buckshot. At some casts no buckshot was made, but when it did appear it was almost invariably in the way stated. This was a very unusual thing. In our previous experience with buckshot it had made its appearance with cinder visibly cold, the hearth would soon build up, and iron would be thrown out of the cinder-notch during flushing. In this instance, however, the cinder which preceded and followed the buckshot was hot and fluid, the hearth did not build up, and no iron was thrown out of the cinder-notch. The appearance of the cinder was unusually good. It is our practice to ladle out a sample of each flush of cinder while it is running, and pour it into a scorifying-mould, so that buttons from the various flushes can be compared. At this time there was scarcely any difference noticeable between flushes. One sample would represent the entire day's work; yet at some casts two or three tons of buckshot would run out and at others none. The top of the furnace was as cool as could be expected with such a light burden—about 600°, when the fillers were at work, which would increase to 700° or 750° when they stopped for an hour.

No gas-analyses were made, but the gas was clean and good. No firing was at any time necessary under the boilers, and the bleeder was seldom opened. The slides on the gas-valves of the hot-blast chambers were seldom moved. Everything seemed right, yet the results showed that something was seriously wrong.

The coke strike occurred about the time we were most troubled with buckshot, and it was necessary for several days to increase the porportion of anthracite to 87½ per cent. This resulted in less iron and more buckshot. I mention the fact, as it will have a bearing later on. During the first week in September a slight improvement was noticed; no change had been made in any particular, and there was no reason to think that it was more than a temporary relief, after which a relapse might at any time be expected. The relapse, however, did not come. There was no more buckshot, and the iron indicated that more burdon could be carried. The iron, at the time when the improved working commenced, was peculiar. It was only a good gray-forge in grain, but there was an appearance about it difficult to describe, though familiar to those who grade iron by its fracture, which indicated that it was very much grayer than the grain would lead one to suppose. Burden was added in 40-pound lots, with stone in suitable quantity, and when it came to work, evidence was still given that a little more could be carried. This was done in 40-pound lots at first, and 80-pound after there seemed less danger of overdoing the matter, until 800 pounds more ore was carried by 2000 pounds of fuel than had been possible during the summer. The period of transition from light burden to heavy accupied about three weeks, during which time the iron only varied in grain from very gray-forge to close gray-forge. The volume of blast, measured by piston-displacement, was steadily maintained, and the production increased for the five weeks ending with October to an average of 464.6 tons of iron, made with 1.206 tons of fuel per ton of iron. The best week was 507 tons of iron, made on 1.18 tons fuel-rate. On October 1st, when the price of coke advanced, the proportion in the mixture was reduced to 20 per cent. with which the best work was done. It was further reduced to 12½ per cent., which had caused much trouble during the summer; but at this time it had no such effect, and 488 tons of iron were made in a week with 1.2 tons of fuel. After running two weeks, however, it was deemed advisable to return to 20 per cent. of coke, the production having dropped to 453 tons; and now the production averages 69 tons daily, and the fuel is fairly constant at 1.2 tons per ton of iron. During the summer, when the results were most distressing, the process appeared singularly uniform, and no evidence of scaffolding could be detected. Now there is no uniformity whatever; the stock slips sometimes from 4 to 6 feet at flushing; the cinder varies from bluishwhite with stony fracture to black with vitreous fracture, yet is always hot and fluid. The iron varies from foundry to mottled between casts; and the cinder is but a poor guide, as the gray cinder sometimes makes close iron, and the dark glassy cinder does not always make hard iron. There is much more evidence of scaffolding now than there was during the summer, but the cost-sheet has a much healthier look.

It is likely that, apart from atmospheric conditions, the ordinary causes which affect irregularities of working are: arching of the stock, thereby forming a temporary scaffold; dropping of unprepared stock, which has been adhering to the walls as a fixed scaffold; and filtration of fine ore through the coarse stock, reaching the hearth in the state of ore and desiliconizing the iron, thereby lowering its grade.

I was unable to detect any form of scaffolding, and as the proportion of fine ore in the mixture has not changed, it is not likely that it influenced the process. When a furnace does not work economically, it is customary to say there is a scaffold; but it has seemed to me that this term is often applied to express an abnormal condition, the cause of which is obscure. Scaffolds, in order to exercise a material influence on the process, must occupy considerable space; and, although our means of estimating the working capacity of a furnace between the stock-line and the melting-zone are very crude, it is at least possible to ascertain whether there is a very considerable contraction in the cubic capacity contained between the stock-line and bosh or not.

In furnace No. 2, large fuel-blanks have been discharged, from time to time, when it seemed desirable for any reason to do so; and after 58 to 64 ore-charges were on top of the fuel, its presence became apparent in the melting-zone. There has been no variation observed in this respect at any time during the blast. At one time, during a former blast, when the furnace was working badly, a fuel-blank would work after 27 to 30 charges were on top of it. It was not difficult to determine then that the melting-zone was high, and that a scaffold existed.

It has been my practice to maintain a uniform volume of blast, measured by piston-displacement, under all circumstances, and to distribute the current according to the manner in which the stock settles on top. If the settling is even, tuyeres of equal area are used all around. If there is a marked tendency to settle faster on one side than another for a few days, nozzles are put in the tuyeres under the low side, and the blast, flowing in the direction of least resistance, naturally goes in greater volume through the large tuyeres, and cause the furnace to work faster on the side which was high. In this way incipient scaffolds are moved, and dangerous ones are not likely to form suddenly.

The practice of reducing the speed of the engine whenever the cinder becomes sharp I have always regarded as likely to form scaffolds on account of alternately raising and lowering the melting-zone, and, as I could never see how heat could be generated by diminishing the rate of combustion, I have avoided it.

The working of the furnace in question has been a mystery to me, and this account of it has been written in the hope that it may meet the notice of some among the members of the Institute who have had similar experience, and, more fortunate than I, have ascertained the cause. It is not usual to proclaim one's poor work in all its details and confess ignorance of its cause; but if one cannot get light without opening the windows, they had better be opened, though other people may thus be enabled to look in.

The Royal Mining School of Frieberg.

Of the numerous mining schools of Europe, probably the Royal Saxon "Bergakademie" of Frieberg has trained the largest number of successful miners and metallurgists, and the title of M.E. of that school is a guarantee of excellence, and serves as a recommendation of the greatest value. The reason of this is obvious when we know that the system of instruction carried on here is a thoroughly practical one, so that the students are brought into actual contact with the operations on a large scale. The object of this time-honored institution is to give a complete scientific education, both of a theoretical and practical character, to young men intended for metallurgists or mining engineers. Admission to the school for Saxons and Germans is made dependent on having passed the Maturitats examination of a gymnasium or first class Real-school, but foreigners are received without examination, provided they bring certificates of competence from some recognized scientific or educational institution, and this liberality on the part of the Saxon Government has been largely availed of by many distinguished English and American metallurgists and mining engineers. Regular courses of study are laid down, extending over four years and differing according as the pupil desires to follow the mining or the metallurgical branch of the profession. Higher mathematics, descriptive geometry, spherical trigonometry, physics, chemistry, mineralogy, geology and mechanical drawing form the groundwork of the studies, to which are added, in the second and succeeding years, the special subjects of mining and metallurgy, and all their allied branches of science, taught by lectures, laboratory practice, by working and surveying in the mines, and by practical metallurgical instruction in the smelting works of the Saxon state.

The collections of mineralogical and geological specimens are most complete, and with the libraries and museums of mining machinery are open to all the students of the school. Many of the professors have been men of European fame—Werner, Plattner, and now Richter and Weisbach, are names know to and honored by all students of science. The lectures of Richter on the blow-pipe are unique, and those of Prof. Weisbach on mineralogy are most valuable. But the most important respect in which Freiberg excels is the practical experience which the students can gain in the operations of smelting conducted on a large scale in the government smelting works (the Müldnerhütte and that at Halsbrücke) as well as in those of mining by visiting the neighboring mines belonging to the Saxon government. As these mines now yield ore of only the poorest quality the operations have to be conducted with great care, and hence offer to the student of mining training of an exceptional character, while the number of metals present in the ore (gold, silver, copper, lead, bismuth, arsenic and antimony) and worked up at the smelting works afford a no less valuable one to the student in many branches of metallurgy. The cost of living in Freiberg, including the fees payable to the academy, need not exceed £100 per annum. The average number of students in training for the last ten years: Saxons and Germans, 64; foreigners, 58. Freiberg does not, however, afford practical instruction in iron mining or smelting; the mining school specially adapted for the study of the metallurgy of iron is that of Leoben in Styria under its veteran head, Prof. von Tunner.

The Invisible Costs in Quarrying.

Those unacquainted with the stone business are apt, like novitiates in other lines, to underestimate the costs. They see a body of stone accessible, and they know what it will cost to extract a given number of square yards of it. They also may know how much a given number of men with a given number of gangs of saws may saw up in a given time. If they base their costs on this, they will see a profit where old quarrymen claim a loss. But usually they seldom reckon on the "invisible costs" which, like Banquo's ghost, will rise to confront them at most inopportune moments.

In the first place novitiates seldom reckon on the loss their quarry beds sustain. Every foot of stone taken from a quarry represents an irretrievable loss to it. It can never be replaced. and as time goes on acres and acres of territory are denuded of their wealth, until finally they are exhausted. The costs of quarrying it do not represent this loss, which must be added, or the time will come when the operations must cease, or the profits of the business must provide means for the purchase and opening of new territory.

Again, the young quarryman will start out with a full complement of derricks, channeling machines, drills and power plant, all new. But from this instant they begin to wear, and the time rapidly approaches when the profits of the business must guarantee a new outfit; or else new devices are invented that lead to the same result, or the business must join the long list of the unprofitable.

Again, in placing the stone on the market, are a number of unforeseen adverse conditions. A piece of stone worth hundreds of dollars will get broken, to be reproduced without pay. A favorite and prompt-paying customer goes bankrupt (and this will occasionally happen to the most conservative manager). Then are added costs of delays, breakage and direlictions of railroad companies, and the costs of their own agents, none of which figure in the cost of extracting numberless yards of stone in quarry.

Every penny of waste, every penny of cost, every cent for repair down to the last drop of oil, will soon or late rise up for liquidation. Yet they are invisible in the estimate of cost for a given number of yards of quarry production. And it will take nearly 20 per cent. added, and it may take 33, to make the items of cost equal the items of receipts where these various losses are considered.

When a young quarryman begins he rarely considers these invisible but constant losses. He sees the older men charging more than he figures he can take out a given number of cubic yards for, and he concludes there is a bonanza in it, and all he has to do is to get on the market, even if at the loss of a few cents, which he con-

ceives he can make out of these great "profits." He finds out his mistake—he has learned the invisible costs, but meantime he has forced the older men to reduce theirs in order to retain the market they have already earned. He has destroyed his own profits, and reduced those of his competitors, and the result is the entire trade is lowered in tone, capacity and profit.

On the other hand is the old quarryman who either has, or conceives he has, a quarry so easy to work that competition with him is fruitless, and who may from this fact further improve his sales by reducing his prices. Failing to pocket the profit that his good fortune assures him, he strikes at the income of his neighbour. It is notorious that the consumer is paying the contractor prices out of all proportion with what the quarryman is getting, and which a well-understood basis or organization could easily remedy. If a portion of the profit in the stone business now going to the contractor and other middlemen were divided with themselves and consumer, advantage to both would result, and the use of stone greatly extended, while the quarryman, with much more business, at the same time would reap a higher price.—*Stone.*

The Superphosphate Works at Smith's Falls.

The following description of the Standard Fertilizer and Chemical Co.'s works at Smith's Falls, Ont., is given by the Commissioners in their Report just issued :—

Various grades of superphosphate are manufactured for fertilizing purposes, and acid phosphate is also made at the works which is used for baking powder, etc. The sulphuric acid used in the process is manufactured from brimstone imported from Scicily, and costing at Smith's Falls one cent per pound. The apatite is ground very fine by burrstones, after which it is conveyed into a vat by means of a fan. The coarse dust falls back to the stones and is reground. The apatite requires to be pulverized to such a degree of fineness that if bolted it would go through a 120 mesh, or at least an 80 mesh. The charge is weighed out, moistened with sulphuric acid and run into the mixer, and thence into an air-tight bin that has a wooden funnel above to carry off the hydrofluoric acid which generates. The acid and phosphate of lime work in this bin and solidify in twenty-four hours. It is then broken up by a sort of disintegrator, and after being mixed with various proportions of hydrochloric acid, ammonium, potash, ammonium sulphate and nitrate of soda, it is ready for shipment. The following grade of fertilizers are manufactured :—

No. I.....	$ 32.00	per ton.
No. II Standard.....	35.00	"
No. III Special.....	40.00	"
No. IV. Fruit Tree.....	42.00	"
Plain Superphosphate.....	26.00	"

Acid phosphate is also manufactured by this company. Only the purest ground phosphate is used for its production, which is carefully sorted by hand. After the acid has dissolved the phosphate the charge is leached off, and the product is the liquid phosphate. This is then evaporated down to a syrupy condition, is mixed with starch and dried, after which it is ground. It is used as a substitute for cream of tartar, and chiefly as a baking powder. The phosphate used at the works comes from Burgess and from Buckingham. The high grade (83 or 84 per cent.) used for acid phosphate costs $17.50 at the factory, and the low grade (65 per cent.) costs about $9.60. Farmers use about 300 pounds of the fertilizer to the acre, and that quantity is claimed to have the same effect as 25 wagon loads of well-rotted barn-yard manure. Market gardeners use 800 to 1,000 lbs. per acre. The ammonium sulphate costs $60 per ton, and $11 worth is put in a ton of the fertilizer. This and the potash are imported from Germany. Of the output of the works about seven-eighths of the grades is special and standard, and the price obtained averages $35 per ton. The lead chambers in the works cost about $10,000, and the pure sulphur is said to be much less severe upon these than when iron pyrites is used. The sulphur also occupies less room, and a boy can look after the furnace. The cost of producing sulphuric acid is about 70 cents per 100 pounds.

New Use for Mica.

The principal use to which mica has been put heretofore was for stove doors and for decorative purposes, such as bronzing, wall-papering, etc. When properly prepared, it can be used for a variety of purposes, and the discovery of this fact has led inventive genius to supply a process whereby it can be so utilized, and machinery has been brought out for the purpose of handling the mineral.

The new field thus opened to this mineral is as a lubricant for railroad purposes, and its value for this purpose lies in the fact that it is absolutely anti-friction, and it is claimed that with its use hot boxes or journals are simply impossible. A company has been incorporated in Denver, Colorado, under the name of the Railroad Mica Lubricating Company, with a capital of $200,000, and they have purchased the machinery, together with the process of manufacture, all of which are covered by patents. A visitor to the factory thus describes operations :—

The mica comes to the factory in carloads, just as it is taken from the mine. It is fed by boys into two machines, which cut it into fragments about half an inch in size. By a system of pneumatic tubes the mica, so cut, is delivered to the atomizing machines, which grind it into powder.

These machines one must see to fully realize their peculiar action and construction. Each machine consists of two steel shafts three feet long, with a series of gun metal spirally arranged beaters, which revolve in a closed case forming a figure. When in operation these machines make from 5,000 to 7,000 revolutions a minute. The beaters on the revolving shafts are so arranged that the fingers on one pass between the fingers on the other shaft, so that when the material is passed through the pneumatic tubes from the feeding machine to the atomizers at a velocity of 15,000 feet a minute, the work of atomizing is instantaneous.

The mica, now reduced to atoms, continues its course at the same velocity through another set of pneumatic tubes to the sifting bins. Here the current is so retarded by the peculiar mechanism that it causes the material to settle in the various compartments, of which there are six, at the same time grading the material according to its fineness. The powdered mica is now settled in the hoppers or bins, immediately over the mixing pans. Here the several grades are drawn into the pans, which are provided with mechanical mixers, and the lubricant is made up by the use of the proper percentage of oils, mica and such other ingredients as the company uses in the manufacture of the product.

Directly over the hoppers are located the oil tanks, which supply the mixers by a pipe running down on the outside of the hopper, on the end of which is a faucet.

At the south end of the bins there is located a large cylindrical machine four feet in diameter and ten feet high, that is called a dust arrester. Any of the material that is so light and fine that it will not settle is driven into this machine by air currents, which thoroughly separate the mica dust from the air, where it settles in the bottom of the machine and is drawn off as needed.

It is stated that the capacity of all machinery heretofore made for pulverizing mica has been from 300 to 400 pounds a day, and then the material has not been sufficiently fine for lubricating purposes. It is claimed for this new concern that it can pulverize about five tons a day, or in ten hours running.

Estimating the Cost of Foundry Work.—In a paper read before the American Society of Mechanical Engineers, Mr. G. L. Fowler observes that the expense of moulding is the basis upon which all estimates and calculations should be founded, coupled with a careful consideration of the weights and cost of the iron and fuel. The author classifies the expenditure under various heads, and then determines in what relationship they stand to one another. The various ratios having been determined, the timekeeper should every day take the time of each moulder and the work on which he has been engaged. This gives the necessary basis for the calculation of the cost. The various ratios already determined are added together and multiplied by the wages paid ; to the product is then added the wages, and the cost of the iron in the casting. The result is the cost of the casting. The author gives the following example ; 40 cents is paid for moulding a grate-bar weighing 100 lbs ; the sum of the several ratios is 1·2, and the cost of iron and fuel was 1 cent per lb. of casting, then :—

Sum of all ratios multiplied by the moulder's wages..	$0 48
Moulder's wages.....	0 40
Cost of iron.....	1 00
Total cost of the grate-bar.....	$1 88

The author states that this method of calculation has been employed for the last seventeen years by Mr. A. Messerschmidt at Essen, Germany. The author, too, has found in his own experience of the practical application of the method, that it is of very considerable commercial value.

Safety cages—A good many years ago what are known as safety cages were not uncommon in England, and on the Continent they were compulsory by law. Their action is simple ; so long as the load is on the rope the catches on the cage are out of action ; but when a rope breaks, and the load goes off, the catches come into action, grip the conductors, and hold the cage. There were two advantages which these safety cages formerly had—the speed of winding was slow, and the conductors were of wood, affording facilities for gripping. Now the speed of winding is very rapid, and the conductors, a good many of them, are of wire. There is some danger of such cages acting when they should not, and not gripping when they should. It is a fact that safety cages are not now as numerous in proportion to the collieries as formerly, and on the Continent are not now compulsory. Safety cages are intended to act when ropes break ; but those who do not care for them say that ropes of proper material, well made, worked on proper machinery, and not overloaded, ought not to break, and will not break. It must be remembered also that even with a safety cage we have nothing to prevent the lower part of a broken rope falling down the pit and doing injury.

Coal Mining by Machinery.—In Illinois in 1888 there were 272 machines at work for mining coal. With them, 3,088 men produced 2,243,210 tons of lump coal, or 20 per cent. of the total production. Of these machines, 245 are of the Harrison type, 17 are the Legg or Lechner machines, and 10 are the Yock machines. Owing to the thorough division of labour which the use of machinery induces, it is more likely that both timbering and blasting are efficiently performed.

Shaft Sinking by the Kind-Chaudron Method.—M. J. Chaudron (excerpt from *L'industrie*), gives a list of shafts sunk by the Kind-Chaudron method since 1878. There are five in Belgium, three in France. one in England, and seven in Germany, or sixteen altogether. Full details and illustrations are given of three of the more important. A new departure was made at the collieries of Gneisenau, Westphalia, by lining the shaft only where it passes through water-bearing strata. This was done by closing the lining with a diaphragm, both at the top and bottom, so as to obtain an air-tight vessel into which water could be admitted as desired to control its buoyancy. In order to be certain of stopping out all the water, the lining was carried upwards for a distance of about 82 feet above the water-bearing strata, which were 142 feet thick.

At the salt mines of Thierderhall, Brunswick, great difficulty was experienced owing to running ground. No less than eight separate linings had to be used, each one just overlapping the next, so that the shaft is reduced in diameter from 13 feet 9 inches to 10 feet 3 inches, at a depth of 354 feet.

The Kind-Chaudron method of boring shafts has been successfully carried out, for the eighth time in Germany, at Leopoldshall. Several attempts to sink a new shaft having failed on account of the influx of water, the Kind-Chaudron method was adopted, and the shaft completed in 17 months. The small shaft was sunk with a borer 8¼ feet in diameter and about 16 tons in weight. For the subsequent boring down to the impermeable strata, a tool, 14 feet in diameter and 20 tons in weight, was employed.

Lignite Briquettes.—In a paper read at the German Mining Congress at Halle, the uselessness of attempting to dry the lignite used in the manufacture of briquettes is pointed out by Vollert, experience having shown that the presence of from 15 to 20 per cent. of moisture in the briquette greatly increases its resistance to atmospheric action and to disintegration during transport. Great care has to be taken to prevent the collection of dust during the manufacture of the briquettes, owing to its liability to explode. The numerous arrangements which have been adopted to prevent danger from such explosions are referred to by Schrocker, who shows that, whilst in 1875 there were in North Germany only twenty-nine briquette presses, consuming annually two hundred and fifty thousand tons of lignite, there are, at the present time, 186 such presses at work, each giving employment to 10 men, with an annual consumption of 2,250,000 tons of lignite, and a production of 1,250,000 tons of briquettes. Unfortunately, this manufacture of lignite into briquettes is accompanied by considerable danger, owing to the evolution of hydrogen and other gas, and to the explosive character of the dust produced in the manufacture. This dangerous deposition of dust takes place partly during the preliminary drying of the fuel, but more especially during the transport of the dried material to the press. In conclusion, the various mechanical arrangements which have been introduced to prevent such dust deposits are referred to.

Government Assistance to Schools of Mines.—The Mines Department of New Zealand has imported from London, for the use of the schools, chemicals and apparatus to the value of about £400. It has also procured from Germany eleven collections of ores, rocks, and other minerals for distribution among the schools of mines. Each of these collections cost about £35, and includes 200 specimens of metallic ores, 50 specimens of rocks and 30 specimens of minerals that accompany the metallic ores and indicative of the same, besides an assortment of minerals to show degrees of hardness, and 110 samples for blowpipe testing. with blowpipes for same.

The Petrolia Oil Wells.—The wells are drilled 4⅝ inches in diameter, and where casing is put down it is rimmed out ¾ or ½ of an inch, the casing being 4⅝ inside and 5⅛ inches outside diameter. The hole is put down in about five or six days, and costs from $150 to $160. In the early days the cost ranged from $1 to $3 per foot, and the time occupied from two to six months. Wooden rods are now used altogether instead of cables, a steel drill 3½ inches in diameter and 25 to 30 feet long being attached to the lowest section. Two shifts of three men each form a drilling gang. These Petrolia drillers are very expert, and are called for all over the world, much work being done by them in Europe, Asia and Australia.

SEALED TENDERS addressed to the undersigned, and endorsed "Tender for supplying Coal for the Public Buildings, Ottawa," will be received at this office until FRIDAY, 23rd inst., at noon.

Specifications can be seea and forms of Tender obtained, on and after Friday, the 16th instant, at this office, where all necessary information can be had on application; also at the office of James Nelson, Architect, Montreal, and at the Dominion Public Works Office, Post Office Building, Quebec.

Each tender must be accompanied by an *accepted* bank cheque *for the sum of* $300, made payable to the order of the Honourable the Minister of Public Works, which will be forfeited if the party decline to enter into a contract when called upon to do so, or if he fail to complete the work contracted for. If the tender be not accepted, the cheque will be returned.

The Department will not be bound to accept the lowest or any tender.

By order,
A. GOBEIL,
Secretary.

Department of Public Works,
Ottawa, 13th May, 1800.

North-West Mounted Police.

RECRUITS.

APPLICANTS must be between the ages of Twenty-two and Forty, active, able-bodied men of thoroughly sound constitution, and must produce certificates of exemplary character and sobriety.

They must understand the care and management of horses, aud be able to ride well.

The minimum height is 5 feet 8 inches, the minimum chest measurement 35 inches, and th maximum weight 175 pounds.

The term of engagement is five years.

The rates of pay are as follows:—

Staff-Sergeants .....$1.00 to $1.50 per day
Other Non-Com. Officers.. 85c. to 1.00 "

	Service pay.	Good conduct pay.	Total.	
1st year's service,	50c.	——	50c.	per day.
2nd "	50	5c.	55	"
3rd	50	10	60	"
4th	50	15	65	"
5th "	50	20	70	"

Extra pay is allowed to a limited number of blacksmiths, carpenters and other artizans.

Members of the force are supplied with free rations, a free kit on joining and periodical issues during the term of service.

Applicants may be engaged at the Immigration office, Winnipeg, Manitoba; or at the Head quarters of the Force, Regina, N.W.T.

THE

BELL TELEPHONE CO.

OF CANADA.

ANDREW ROBERTSON, - - - - - - - - PRESIDENT
C. F. SISE, - - - - - - - - - - - VICE-PRESIDENT
C. P. SCLATER, - - - - : - - - SECRETARY-TREASURER

HEAD OFFICE, - MONTREAL.

H. C. BAKER, - - - - - Manager Ontario Department, HAMILTON.

This Company will sell its instruments at prices ranging from $10 to $25 per set. These instruments are under the protection of the Company's patents, and purchasers are therefore entirely free from risk of litigation.

This Company will arrange to connect places not having telegraphic facilities with the nearest telegraph office, or it will build private lines for firms or individuals, connecting their places of business or residences. It is also prepared to manufacture all kinds of electrical apparatus.

Full particulars can be obtained the at Company's offices as above, or at St. John, N.B., Halifax, N.S., Winnipeg, Man., Victoria, B.C.

TENDERS.

SEALED TENDERS marked "For Mounted Police Provisions and Light Supplies," and addressed to the Honourable the Minister of Railways and Canals, Ottawa, will be received up to noon on Tuesday, 3rd June, 1890.

Printed forms of tender, containing full information as to the articles and approximate quantities required, may be had on application at any of the Mounted Police Posts in the North-West, or at the office of the undersigned.

No tender will be received unless made on such printed forms.

The lowest or any tender not necessarily accepted.

Each tender must be accompanied by an accepted Canadian bank cheque for an amount equal to ten per cent. of the total value of the articles tendered for, whlch will be forfeited if the party declines to enter into a contract when called upon to do so, or if he fails to complete the service contracted for. If the tender be not accepted the cheque will be returned.

No payment will be made to newspapers inserting this advertisement without authority having been first obtained.

FRED. WHITE,
Comptroller, N. W. M. Police

Ottawa, April 22nd, 1890.

Standard Powder Company

MANUFACTURERS OF ALL KINDS OF

GLYCERINE

EXPLOSIVES

—FOR—

MINING

—AND—

RAILROAD WORK.

ADDRESS—

W. H. HARRISON,
MANAGER,
BROCKVILLE, ONT.

MONEY ORDERS.

MONEY ORDERS may be obtained at any Money Order Office in Canada, payable in the Dominion and Newfoundland; also in the United States, the United Kingdom, France, Germany, Austria, Hungary, Italy, Belgium, Switzerland, Portugal, Sweden, Norway, Denmark, the Netherlands, India, Japan, the Australian Colonies, and other countries and British Colonies generally.

On Money Orders payable within Canada the commission is as follows:

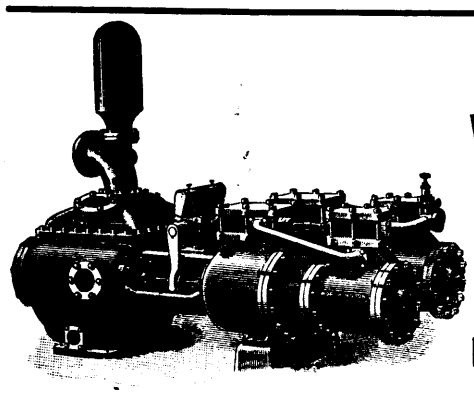
If not exceeding $4				2c.
Over $4, not exceeding			$10	5c.
" 10,	"	"	20	10c.
" 20,	"	"	40	20c.
" 40,	"	"	60	30c.
" 60,	"	"	80	40c.
" 80,	"	"	100	50c.

On Money Orders payable abroad the commission is:

If not exceeding $10				10c.
Over $10, not exceeding			$20	20c.
" 20,	"	"	30	30c.
" 30,	"	"	40	40c
" 40,		"	50	50c.

For further information see OFFICIAL POSTAL GUIDE.

Post Office Department, Ottawa.
1st November, 1089.



Canadian Agents for

WORTHINGTON DUPLEX

Steam Pumps,

—FOR—

MINES, QUARRIES AND OTHER PURPOSES

Machinery of all kinds.

R. H. BUCHANAN & Co., 64 Craig St.,

Builders of Water Works. **MONTREAL.** Send for Circular.

CANADA ATLANTIC

RAILWAY.

THE SHORTEST PASSENGER ROUTE BETWEEN

Ottawa & Montreal

AND ALL POINTS EAST & SOUTH.

The only road in Canada running trains lighted with electricity and heated by steam from the engine. Luxurious Buffet Pullman Palace Cars on all trains between Ottawa and Montreal. Only line running through Sleeping Cars between

OTTAWA, BOSTON AND NEW YORK

And all New England and New York points.

Baggage checked to all points and passed by Customs in transit.

For Tickets, Time Tables and information apply to nearest agent, or to S. EBBS, City Passenger Agent,
GEO. H. PHILLIPS, Gen. Agent, 24 Sparks St., OTTAWA.
VALLEYFIELD.
A. E. CAIRNS, General Agent,
136 St. Jcmes St., MONTREAL

Or at 260 Washington St., Boston, and
317 Broadway, New York.

E. J. CHAMBERLAIN, General Manager,
C. J. SMITH, General Passenger Agent.
General Offices, Ottawa.

TENDERS.

SEALED TENDERS addressed to the undersigned, and endorsed "Tender for Indian Supplies," will be received at this office up to noon of MONDAY, 21st April, 1890, for the delivery of Indian Supplies, during the fiscal year ending 30th June, 1891, consisting of Flour, Beef, Bacon, Groceries, Ammunition, Twine, Agricultural Implements, Tools, &c., duty paid, at various points in Manitoba and the North-West Territories.

Forms of tender, containing full particulars relative to the Supplies required, dates of delivery, &c. may be had by applying to the undersigned, or to the Indian Commissioner at Regina, or to the Indian Office, Winnipeg.

Parties may tender for each description of goods (or for any portion of each description of goods) separately or for all the goods called for in the Schedules, and the Department reserves to itself the right to reject the whole or any part of a tender.

Each tender must be accompanied by an accepted Cheque in favor of the Superintendent General of Indian Affairs, on a Canadian Bank, for at least five per cent. of the amount of the tender, which will be forfeited if the party tendering declines to enter into a contract based on such tender when called upon to do so, or if he fails to complete the work contracted for. If the tender be not accepted the cheque will be returned.

Each tender must, in addition to the signature of the tenderer, be signed by two sureties acceptable to the Department for the proper performance of the contract based on his fender.

This advertisement is not to be inserted by any newspaper without the authority of the Queen's Printer, and no claim for payment by any newspaper not having had such authority will be admitted.

L. VANKOUGHNET,
Deputy of the Superintendent-General of Indian Affairs.

Department of Indian Affairs,
Ottawa March, 1890.

PROVINCE OF NOVA SCOTIA.

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

— AND —

PRECIOUS STONES.

Titles given direct from the Crown, Royalties & Rentals moderate

GOLD AND SILVER.

Under the provisions of chap. 7, Revised Statutes, of Mines and Minerals Licenses are issued for prospecting Gold and Silver for a term of six months, which can be extended by renewal for another six months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. Up to ten areas the cost is 50 cents per area, for every area in addition in same application 25 cents. Cost of renewal one half the original fees. Leases of any number of areas are granted for a term of 21 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19.00 an ounce, and in smelted Gold valued at $18.00 an ounce.

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

MINES OTHER THAN GOLD AND SILVER.

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

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

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

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

The royalties on the remaining minerals are :—Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 7½ cents on every ton sold.

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

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

THE HON. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX

NOVA SCOTIA.

DEPARTMENT

OF

Inland Revenue.

AN ACT RESPECTING AGRICULTURAL FERTILIZERS.

The public is hereby notified that the provisions of the Act respecting AGRICULTURAL FERTILIZERS came into force on the 1st of January, 1886 and that all Fertilizers sold thereafter require to be sold subject to the conditions and restrictions therein contained—the main features of which are as follows:

The expression "fertilizer" means and includes all fertilizers which are sold at more than TEN DOLLARS per ton, and which contains ammonia, or its equivalent of nitrogen, or phosphoric acid.

Every manufacturer or importer of fertilizers for sale, shall, in the course of the month of January in each year, and before offering the same fertilizer for sale, transmit to the Minister of Inland Revenue, carriage paid, a sealed glass jar, containing at least two pounds of the fertilizer manufactured or imported by him, with the certificate of analysis of the same, together with an affidavit setting forth that each jar contains a fair average sample of the fertilizer manufactured or imported by him; and such sample shall be preserved by the Minister of Inland Revenue for the purpose of comparison with any sample of fertilizer which is obtained in the course of the twelve months then next ensuing from such manufacturer or importer, or collected under the provisions of the Adulteration Act, or is transmitted to the chief analyst for analysis.

If the fertilizer is put up in packages, every such package intended for sale or distribution within Canada shall have the manufacturer's certificate of analysis placed upon or securely attached to each package by the manufacturer; if the fertilizer is in bags it shall be distinctly stamped or printed upon each bag; if it is in barrels, it shall be either branded, stamped or printed upon the head of each barrel or distinctly printed upon good paper and securely pasted upon the head of each barrel, or upon a tag securely attached to the head of each barrel; if it is in bulk, the manufacturer's certicate shall be produced and a copy given to each purchaser.

No fertilizer shall be sold or offered or exposed for sale unless a certificate of analysis and sample of the same shall have been transmitted to the Minister of Inland Revenue and the provisions of the foregoing sub-section have been complied with.

Every person who sells or offers or exposes for sale any fertilizer, in respect of which the provisions of this Act have not been complied with—or who permits a certificate of analysis to be attached to any package, bag or barrel of such fertilizer, or to be produced to the inspectors to accompany the bill of inspection of such inspector, stating that the fertilizer contains a larger percentage of the constituents mentionod in sub-section No. 11 of the Act than is contained therein—or who sells, offers or exposes for sale any fertilizer purporting to have been inspected, and which does not contain the percentage of constituents mentioned in the next preceding section—or who sells or offers or exposes for sale any fertilizer which does not contain the percentage of constituents mentioned in the manufacturer's certificate accompanying the same, shall be liable in each case to a penalty not exceeding fifty dollars for the first offence, and for each subsequent offence to a penalty not exceeding one hundred dollars. Provided always that deficiency of one *per centum* of the ammonia, or its equivalent of nitrogen, or of the phosphoric acid, claimed to be contained, shall not be considered as evidence of fraudulent intent.

The Act passed in the forty-seventh year of Her Majesty's reign, chaptered thirty-seven and entitled, "*An Act to prevent fraud in the manufacture and sale of agricultural fertilizers,*" is by this Act repealed, except in regard to any offence committed against it or any prosecution or other act commenced and not concluded or completed, and any payment of money due in respect of any provision thereof.

A copy of the Act may be obtained upon application to the Department of Inland Revenue, as well as a copy of a Bulletin which it is proposed to issue in April, 1888, concerning the fertilizers

E. MIALL,
Commissioner.

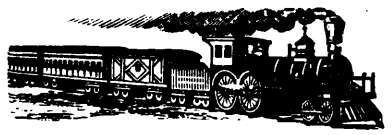
January, 1889.

NOTICE

Is hereby given that all communications in respect to matters affecting the Department of Indian Affairs should be addressed to the Honorable E. Dewdney as Superintendent General of Indian Affairs, and not as Minister of the Interior, or to the undersigned. All Officers of the Department should address their official letters to the undersigned.

L. VANKOUGHNET,
Deputy Soperintendent-General of India Affairs.

Department of Indian Affairs,
Ottawa, 11th May, 1889.



Intercolonial Railway

OF CANADA.

The direct route between the West and all points on the Lower St. Lawrence and Baie des Chaleur, Province of Quebec; also for New Brunswick, Nova Scotia, Prince Edward and Cape Breton Islands, Newfoundland and St. Pierre.

EXPRESS TRAINS leave Montreal and Halifax daily (Sunday excepted) and run hrough without change between these points in 30 hours.

The Through Express Train cars of the Intercolonial Railway are brilliantly lighted by electricity and heated by steam from the locomotive, thus greatly increasing the comfort and safety of travellers.

New and Elegant Buffet Sleeping and Day Cars are run on all through Express Trains

CANADIAN EUROPEAN MAIL

AND PASSENGER ROUTE.

Passengers for Great Britain or the Continent by leaving Montreal on Friday morning wil join Outward Mail Steamer at Halifax the same evening.

The attention of shippers is directed to the superior facilities offered by this route for the transport of flour and general merchandise intended for the Eastern Provinces and Newfoundland; also for shipments of grain and produce intended for the European market.

Tickets may be obtained and all information about the route, also Freight and Passenger rates, on application to

G. W. ROBINSON,
Eastern Freight and Passenger Agent,
136½ St. James St., MONTREAL.

E. KING,
Ticket Agent,
27 Sparks Street,
OTTAWA.

D. POTTINGER,
Chief Superintendent.

Railway Offices, Moncton, N.B
14th November, 1889.

J. S. HOSSACK, President. C. ANDERSON, Secretary-Treasurer. T. J. CARROLL, General Manager.

HAMILTON BRASS MFG. CO.,

MANUFACTURERS OF

Engineers' and Plumbers' Brass Goods,

BRASS TUBING AND ALL KINDS OF BRASS CASTINGS.

259 & 261 James Street N., - - - - - - - - HAMILTON, ONT.

STATIONERY, MARINE, PORTABLE, AND LOCOMOTIVE BOILERS.

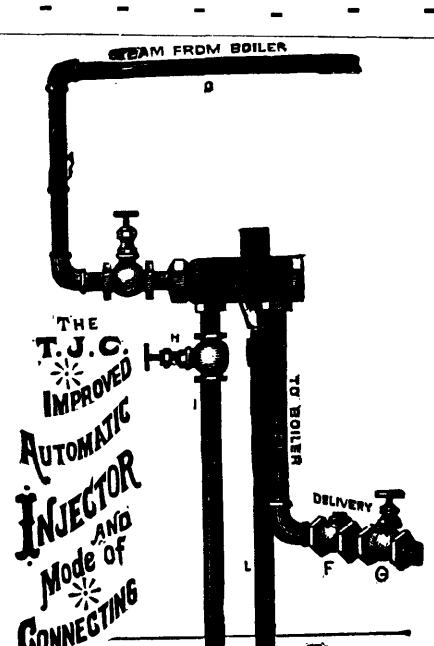
Simple, Reliable and Durable. Every Injector Guaranteed for Two Years.

Range, 25 to 150 lbs., and is the only Automatic Injector in the world that can be operated by opening one valve, and that the overflow. Can have a pipe connected to conduct the overflow to tank or sewer. The only Injector having a Signal Valve to show when the Injector is working; all other boiler feeders not having this cannot be connected to return the overflow to tank or sewer.

OUR PROPOSITION:

As every Injector is tested before it leaves the factory, we know that if properly connected (as in diagram) and instructions are carried out, they cannot fail to work. We therefore offer to **pay the expenses** of any man to come to the factory, and **$25.00 per day while there**, if the Injector does not work, provided it has not been misused.

As the body will last for years, it is only necessary to order working parts to make Injector good as new. Every purchaser can repair his own Injector without sending it to the factory.



NUMBER.	PRICE.	HORSE POWER.
7½	$ 4 50	4 to 8
8¾	6 00	8 to 12
10	7 00	12 to 16
12½	9 00	16 to 28
15	10 50	28 to 40
17½	14 00	40 to 57
20	15 00	57 to 72
22½	21 00	72 to 93
25	22 50	93 to 120
30	27 00	120 to 160
35	30 00	160 to 220
40	35 00	220 to 290
45	38 00	290 to 308

Mining Regulations

TO GOVERN THE DISPOSAL OF

Mineral Lands other than Coal Lands, 1886.

THESE REGULATIONS shall be applicable to all Dominion Lands containing gold, silver, cinnabar, lead, tin, copper, petroleum, iron or other mineral deposits of economic value, with the exception of coal.

Any person may explore vacant Dominion Lands not appropriated or reserved by Government for other purposes, and may search therein, either by surface or subterranean prospecting for mineral deposits, with a view to obtaining under the Regulations a mining location for the same but no mining location or mining claim shall be granted until the discovery of the vein, lode or deposit of mineral or metal within the limits of the location or claim.

QUARTZ MINING

A location for mining, except for iron on veins, lodes or ledges of quartz or other rock in place shall not exceed forty acres in area. Its length shall not be more than three times its breadth and its surface boundary shall be four straight lines, the opposite sides of which shall be parallel, except where prior locations would prevent, in which case it may be of such a shape as may be approved of by the Superintendent of Mining.

Any person having discovered a mineral deposit may obtain a mining location therefor, in the manner set forth in the Regulations which provides for the character of the survey and the marks necessary to designate the location on the ground.

When the location has been marked conformably to the requirements of the Regulations, the claimant shall within sixty days thereafter, file with the local agent in the Dominion Land Office for the district in which the location is situated, a declaration or oath setting forth the circumstances of his discovery, and describing, as nearly as may be, the locality and dimensions of the claim marked out by him as aforesaid; and shall, along with such declaration, pay to the said agent an entry fee of FIVE DOLLARS. The agent's receipt for such fee will be the claimant's authority to enter into possession of the location applied for.

At any time before the expiration of FIVE years from the date of his obtaining the agent's receipt it shall be open to the claimant to purchase the location on filing with the local agent proof that he has expended not less than FIVE HUNDRED DOLLARS in actual mining operations on the same; but the claimant is required, before the expiration of each of the five years, to prove that he has performed not less than ONE HUNDRED DOLLARS' worth of labor during the year in the actual development of his claim, and at the same time obtain a renewal of his location receipt, for which he is required to pay a fee of FIVE DOLLARS.

The price to be paid for a mining location shall be at the rate of FIVE DOLLARS PER ACRE, cash, and the sum of FIFTY DOLLARS extra for the survey of the same.

No more than one mining location shall be granted to any individual claimant upon the same lode or vein.

IRON.

The Minister of the Interior may grant a location for the mining of iron, not exceeding 160 acres in area, which shall be bounded by north and south and east and west lines astronomically, and its breadth shall equal it length. Provided that should any person making an application purporting to be for the purpose of mining iron thus obtain, whether in good faith or fradulently, possession of a valuable mineral deposit other than iron, his right in such deposit shall be restricted to the area prescribed by the Regulations for other minerals, and the rest of the location shall revert to the Crown for such disposition as the Minister may direct.

The regulations also provide for the manner in which land may by acquired for milling purposes, reduction works or other works incidental to mining operations.

Locations taken up prior to this date may, until the 1st of August, 1886, be re-marked and re-entered in conformity with the Regulations without payment of new fees in cases where no existing interests would thereby be prejudicially affected.

PLACER MINING.

The Regulations laid down in respect to quartz mining shall be applicable to placer mining as far as they relate to entries, entry fees, assignments, marking of localities, agents' receipts, and generally where they can be applied.

The nature and size of placer mining claims are provided for in the Regulations, including bar, dry, bench, creek or hill diggings, and the RIGHTS AND DUTIES OF MINERS are fully set forth.

The Regulations apply also to

BED-ROCK FLUMES, DRAINAGE OF MINES AND DITCHES.

The GENERAL PROVISIONS of the Regulations include the interpretation of expressions used therein; how disputes shall be heard and adjudicated upon; under what circumstances miners shall be entitled to absent themselves from their locations or diggings, etc., etc.

THE SCHEDULE OF MINING REGULATIONS

Contains the *forms* to be observed in the drawing up of all documents such as:—"Application and affidavit of discoverer of quarts mine." "Receipt for fee paid by applicant for mining location." "Receipt for fee on extension of time for purchase of a mining location." "Patent of a mining location." 'Certificate of the assignment of a mining location." 'Application for grant for placer mining and affidavit of applicant." 'Grant for placer mining." "Certificate of the a signment of a placer mining claim." "Grant to a bed rock flume company." "Grant for drainage." "Grant of right to divert water and construct ditches."

Since the publication, in 1884, of the Mining Regulations to govern the disposal of Dominian Mineral Lands the same have been carefully and thoroughly revised with a view to ensure ample protection to the public interests, and at the same time to encourage the prospector and miner in order that the mineral resources may be made valuable by development.

COPIES OF THE REGULATIONS MAY BE OBTAINED UPON APPLICATION TO THE DEPARTMENT OF THE INTERIOR.

A. M. BURGESS,

Deputy Minister of the Interior