

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

CONDUCTED BY B. T. A. BELL
 OFFICES:
 UNION CHAMBERS, 14 METCALFE ST.,
 OTTAWA.

Vol. IX. OCTOBER, 1890. No. 10

Visit of the Iron and Steel Institute to Canada.

A party of the members of the Iron and Steel Institute of Great Britain and German Association of Iron Smelters, numbering nearly one hundred ladies and gentlemen, have accepted the invitation of the Federal and Ontario Governments to visit the Dominion. The party will enter Canada at Niagara Falls, where they will be met by Dr. Selwyn, Director of the Geological Survey of Canada, and Mr. B. T. A. Bell, Editor of THE CANADIAN MINING REVIEW, who are entrusted with the arrangements on behalf of the Dominion Government. After a visit to the Falls the party will enter a special train on the morning of the 29th and leave for Toronto via Hamilton. The following is a brief outline of the programme prepared for the reception and entertainment of the distinguished visitors:—

OCTOBER 29TH—WEDNESDAY.

Reception at Toronto. Drive to Public Buildings. Banquet given by Board of Trade in evening. Leave Toronto via Grand Trunk Railway Special Train for Sudbury at 11 p.m.

OCTOBER 30TH—THURSDAY.

Visit Mines and Works of Canadian Copper Company, H. H. Vivian & Co., and Dominion Mineral Company. Leave per Special Train for Ottawa at six p.m.

OCTOBER 31ST—FRIDAY.

Arrive in Ottawa noon. Reception by Cabinet Ministers. Drive to Lumber Mills, Chaudiere Falls, Pulp and Match Factories, Parliament and other Public Buildings, etc. Attend "At Home" given by citizens in Russell House. Hotel Headquarters, Russell House.

NOVEMBER 1ST.

FORENOON—Visit Geological Survey Museum and Offices. Luncheon given by the Federal Government, to be presided over by His Excellency the Governor General. Leave per Canada Atlantic R'y for Montreal at five o'clock p.m. Arrive in Montreal 8.15. Hotel headquarters, Windsor.

NOVEMBER 2ND—SUNDAY.

NOVEMBER 3RD—MONDAY.

Party will leave per Train in morning for Lachine where they will Shoot the Rapids and return in time for Luncheon. Drive in afternoon to Mount Royal, Public Buildings, Redpath Museum, McGill University, etc. Reception in evening.

NOVEMBER 4TH—TUESDAY.

Programme under consideration.

It is greatly to be regretted that owing to the hurried nature of the visit and the necessarily limited time at the disposal of the visitors, but little opportunity will be afforded them of inspecting our mines and quarries. The invitation was very hastily issued, and at a date that precluded any possibility of an extended visit to

our mining centres. It is hoped, however, that sufficient will be seen of the country to impress them with the extent of its resources, its marked prosperity, and the opportunities and advantages it offers as a field for industrial development and the investment of capital. We extend to the Institute and the German Association of Iron Smelters a hearty welcome to the Dominion, and wish them one and all a pleasant and enjoyable excursion.

Evils Inherent to a Pernicious System of Company Promoting.

During the past year our phosphate districts have been excited by rumours of a great "Trust" in England that intended to buy up vast quantities of phosphate land. A few properties were bonded by visitors from London and by influential Canadians who forthwith visited England "purely for pleasure." A preliminary prospectus was issued, having among its directors the names of the "Marquis of Exeter" and "Sir Charles Tupper, by special permission of the Government." By means of this distinguished support a great array of nobilities was displayed on the List of Founders in the final prospectus, though the name of Sir Charles Tupper had disappeared, possibly in consequence of the fiasco of the Three Rivers Meat Company. The General Phosphate Corporation, with a nominal capital of £1,000,000, offered its shares to the public, who responded so poorly that, notwithstanding the assurance from Lord Stalbridge that 20,000 shares, equal to £200,000, had been allotted, but comparatively small amount of cash was secured, and it became necessary to call upon the Founders, or underwriters, to take up the shares to the extent that they had pledged. It is understood that there has been some demur in responding to these calls, and in many quarters doubts as to the strong financial condition of the company are freely expressed.

We are pleased, however, to note that the Corporation has really purchased the Stewart Lots at the High Falls, the Ross mountain property, also on the Lievres River, and the Murphy Lots in Templeton, provisional to certain conditions agreed to by the vendors. Mr. George Stewart, the vendor of the High Falls property, has contracted to take out a stipulated annual output, and mining operations will be begun forthwith. Mr. Stewart is well known to be a shrewd and practical manager, and we sincerely wish him and the Corporation every success. Our allusion to the circumstances attending the organization of the company is not made in any unfriendly spirit, but rather for the purpose of calling attention to some inherent evils that this and similar undertakings inflict upon the phosphate and other sections of our mining industry. It may be fairly charged that the falling off of some 10,000 tons in the output of phosphate this year is due to the formation of the Corporation. A property that produced nearly 10,000

tons last year was bonded to the promoters of the Corporation, and, in confident expectation of a speedy sale, work was reduced, and the output for the year has been merely nominal. In the Perth district alone nearly 50,000 acres of land were bonded by speculators and offered to the Corporation. Assurances were given that the lands were accepted, and for six months past the visit of the inspector has been a matter of weekly expectation. Repeatedly pits were cleaned out and properties "fixed up" for the anticipated visit, and every little while the report has gone around the country that "the papers were to be signed in a few days." This kept the country in a ferment, and great will be the disappointment if after all the purchases are not made. With the exception of the work of Messrs. Wilson & Green at Black Lake, and the Anglo-Canadian Phosphate Co. at Otty Lake and Bob's Lake, there has been no legitimate mining of any moment done in the whole of this district for a year. A large fortune quickly won by a land sale was a more pleasing prospect than the smaller and slower gains of mining. One property, purchased for \$7,000 by a man of large means, was opened up and held in idleness at an asking price of \$100,000, although the owner could have more than doubled his money in a year by taking out the phosphate already exposed and reasonably assured.

This is the first evil to which we would allude,—the promotion of land speculation and the consequent discouragement of genuine mining operations by the formation of these great "syndicates."

The second evil of such corporations is the limited chance of success that they stand, owing to the heavy expenses with which they are burdened. In this case £10,000 was estimated for promotion expenses. The cost of English visitors and "distinguished experts" has to be met and an "eminent London solicitor" is sent across the ocean to examine titles, which, owing to our simple system of registration of deeds, could be accurately determined by any intelligent lawyer's clerk in the country. The fees of directors are an extra expense, and the salaries of managers and assistants are apt to be larger and more numerous than in private undertakings. The enterprise is thus handicapped from the start with a dead outlay of capital, in addition to the large amount invested in the lands; and here we may remark that the Canadian seller receives only a moderate compensation as a rule, but his asking price for the land is doubled or increased many-fold in the prospectus, the difference going into the pockets of the company promoters or in paying the heavy cost of floating the company. The outcry against high prices of land in Canada is made by men who would think nothing of offering it to the British public for three times the sum, and if any such prices are available we would like to see the money paid out principally in Canada to the men who have developed the properties.

It may as well be frankly stated that past

experience shows that phosphate mining affords a good prospect of a fair commercial gain, but offers a small chance of a great speculative profit. The well-selected property, managed and worked with close economy, will, at present market prices for phosphate, give a return that will be satisfactory to the reasonable investor. But a public company, promoted at great cost, saddled with honorary expenses, obtaining lands at inflated values, and carrying on its work in an extravagant or ill-considered fashion, has a small chance of success.

We would, therefore, urge Canadians to work their lands themselves. They can usually obtain additional working capital at home or abroad in return for a share in their enterprises; and they should be content to accept aid on these terms and look to their legitimate earnings for their reward.

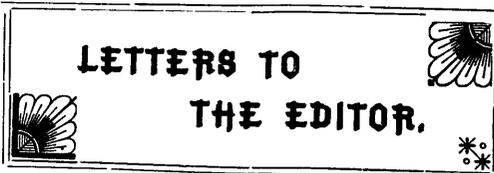
For a year and a half there has been a "phosphate boom" in London, but it has been overwhelmed by the discovery that "all the phosphate land in Canada was for sale." Now Florida phosphates have diverted the attention of speculators, and it may as well be understood that the Canadian boom has burst; and we must add that it has done but little good and a great deal of harm. Let Canadians go to work and do an honest mining business instead of trying to unload their lands upon foreign "syndicates." Then they will have buyers coming to them to purchase their productive mines, and they will in the end have more profit, greater self-respect, and a better reputation than have been gained by the late fruitless efforts to dispose of indefinite mining "prospects" for definite cash.

Profit Sharing at English Ironworks.

On Saturday morning the result was made known of the ballot taken the previous evening, of the workmen employed by the Thames Ironworks & Shipbuilding Co., limited, on the question of the adoption of the proposed scheme for profit sharing submitted to the men by Mr. H. F. Hills, the managing director.

The objects of the scheme were set forth—(1) to unite the interests of all concerned in the works, and to provide that the workmen shall participate in the prosperity of the company; (2) to prevent the friction, waste, and consequent loss from antagonistic views as to the relative claims of capital and labor under varying conditions of trade; (3) to emphasize the fact that in the Thames Ironworks it is in the power of workmen by individual exertions so to improve the work and economise the cost of labor as to enable the company to give them a share of the profits. The conditions were that after receiving £23,750 per annum as interest upon the shareholders' existing capital, the remainder of the profits should each year be equally divided between the company and their employees. Arrangements were made for the keeping of accounts to and for the election of a representative council of sixteen—eight by the company and eight by the workmen of the different trades. Men after six months were to be entitled to participate in the division of profit; the proportion earned by those not in the service six months was to be and form the basis of a provident fund to be administered for the men in a manner agreed upon. It was to be understood that the adoption of the scheme (outside the conditions) would leave the company and the men entire freedom in other respects, and the scheme was to be determined at twelve months' notice on either side. It was first published in April last soon after a strike of joiners at the yard, and was, when put to the vote, emphatically rejected. But the minority of the men, dissatisfied at the result, called the whole workmen together, and negotiations were apparently settled satisfactorily—the six months' service was altered to three months, and six months were fixed upon as the determining period—and the men, having taken the counsel of

various trades unionists, co-operative and socialistic leaders, it was hoped that the next poll of the men would decide to adopt the scheme, a great point being that when it was adopted the definite rules would be formulated by the representative committee, and be submitted to the directors. The poll was by ballot this time, and when the figures were announced they surprised even the more sanguine of the opponents of the scheme. For adoption 507 voted, against 1,206; 107 were neutral, and 15 ballot papers were spoilt. The votes were counted in the presence of the representatives of the men and the company.—*London Iron and Steel Trades Journal.*



The New Phosphate District.

TORONTO, October 13th, 1890.

The Editor:

SIR,—My attention has been called to an article in your issue of last month as to a new phosphate district which has been discovered about fifty miles north-west of Peterborough, and which has been visited by Mr. William Watt of Perth. Doubtless this is the district which our company has lately been operating in as we understand Mr. Watt lately visited it, and as it is important that this new district should not be injured at the start by such unreliable information as you appear to have received about it, I am instructed to send you a short report that was made to us some time ago by a gentleman who visited the district but who is wholly unconnected with this company.

We would be glad if you would help to remove the false impression that your article may have left with the public regarding this district by publishing this report in the next issue of the CANADIAN MINING REVIEW.

The name of the gentleman who made the report can be furnished to you at any time if you so desire it.

Yours, etc.,

J. S. LOCKIE,
Secretary Haliburton Mining Co., Ltd.

REPORT REFERRED TO:

Classification of mines in the Townships of Monmouth and Dudley, in the County of Haliburton, lately opened up by the Haliburton Mining Company, Ltd.

NO. 1 UPPER, LOT 15, CON. II.

Cutting 10 ft. deep and about 40 ft. long. Large deposits of phosphate, calcine and mica. (Large sample red and green phosphate.) Lots of rock phosphate thrown out which could be cobbled.

NO. 2 UPPER, LOT 16, CON. II.

Fine, clean red rock phosphate at the top; also red and green in the workings.

NO. 3 UPPER, LOT 17, CON. 12.

Vein crossing north-east and south-west; width about 20 feet. Very large masses of red rock phosphate; also plenty of mica.

NO. 2, SAME LOT, CON. 3.

500 yards from No. 1; also very fine deposit of red and green phosphates. Phosphate abounding on the surface. Natural drainage from the shaft.

NO. 4, LOT 17, CON. 12.

Just uncovered; same appearance or indication as Nos. 1 and 2. Slightly lower down the hill, with very fine deposit of rock phosphate, equal to any of the others.

NO. 1 LOWER, LOT 15, CON. II.

Very fine deposits of green and red rock phosphate. On the cobbled or waste rock from 10 to 20 per cent. of phosphate adhering to it is absolutely wasted from want of proper machinery for dressing the same, and this applies to all the other deposits mentioned. This pit is about 14 ft. surface. (A very large specimen weighing two or three hundred pounds.) At this time there is ten to twelve tons of clean phosphate ready to ship.

NO. 2, LOWER, LOT 14.

Very large bed of red and green phosphate very near the surface; the pit is about 11 feet deep, phosphate showing at both ends, three feet solid at one of the ends and pretty near the same at the other. About three tons cobbled; enough to make a carload on surface uncobbled,

NO. 3 LOWER, LOT 13.

Eastern boundary. A very great depth of gray and red rock phosphate. Rock coming between the two beds of phosphate. This looks promising.

DUDLEY MINE.

Crystal and rock phosphate on the surface, also in the pit and lots of mica. This phosphate is also of the highest quality, and being only just opened a large vein can be traced to great advantage, but it is anticipated the vein can be approached under more favourable circumstances.

All of the above phosphates are of the very highest grade. An analysis made by Professor Chapman of Toronto University of some of this phosphate shows it to be equivalent to tribasic phosphate of lime 88.89 per cent.

[We cheerfully publish the above and hope that the expectations concerning the new phosphate district will be realized. The best proof of its value would be the production of ore. Our previous informant—a gentleman who, by the way, is fair, unbiassed and thoroughly practical—stated that as the result of three or four months' work on one property he saw one ton of clean phosphate and ten tons of uncobbled rock. The report given above mentions an output of 10 to 12 tons from one pit, and three from another, with a car load to be cobbled. This is the kind of evidence wanted, and not mineralogist's statements of "very large masses," "very fine deposit," "phosphate abounding," "very large bed," "a very great depth of phosphate," etc. A property that answers to this description might soon speak for itself and needs no puffing by experts. We speak in another column concerning the evil tendency to fix up properties for sale instead of working them productively.—Ed.]

The Duty on Mining Machinery.

OTTAWA, 24th Sept., 1890.

The Editor:

MY DEAR SIR,—Mr. Tupper desires me to acknowledge your letter of the 19th inst., and to say that he has asked the Commissioner of Customs for a full report on the subject of your communication.

Mr. Tupper will lay this report before the Privy Council if Mr. Bowell has not returned when the report is ready.

Yours very truly,

C. C. CHIPMAN.

OTTAWA, 20th October, 1890.

The Editor:

DEAR SIR,—Replying to your letter of the 17th inst., I beg to say that I have placed your application with reference to the duties on silvered-copper plates for gold mill amalgamators before the Minister of Customs who has, as you are aware, returned to Ottawa since your previous communication upon the same subject.

Yours faithfully,

CHARLES H. TUPPER.

Tests to be Applied to Slate.—Prospectors looking for slate quarrying locations are often at a loss to know when they really have a good slate. The few following simple rules, familiar to those in the trade, will enable them to distinguish a bad slate from a good one, with sufficient certainty to be useful:—

(1.) As a rule, good slate when struck gives a clear, bell-like sound.

(2.) It is generally considered a good sign when it shatters more or less before the edge of an axe.

(3.) Light blue slate is less absorbent, as a rule, than black blue varieties.

(4.) Good slate has a hard, rough feel, while an absorbent slate feels smooth and greasy.

(5.) The absorptive powers of a slate may be tested in two ways. 1. Place the slate on edge half immersed in water. If it draws up the water and becomes wet at the top in six or eight hours, it is spongy and bad. The extent to which the water ascends is roughly the measure of absorption. 2. Weigh a piece of the slate dry and then again after immersion in the water for twelve hours, after wiping off the superficial moisture; if it shows much increase in weight it is too absorptive to be good.

Our Portrait Gallery.

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

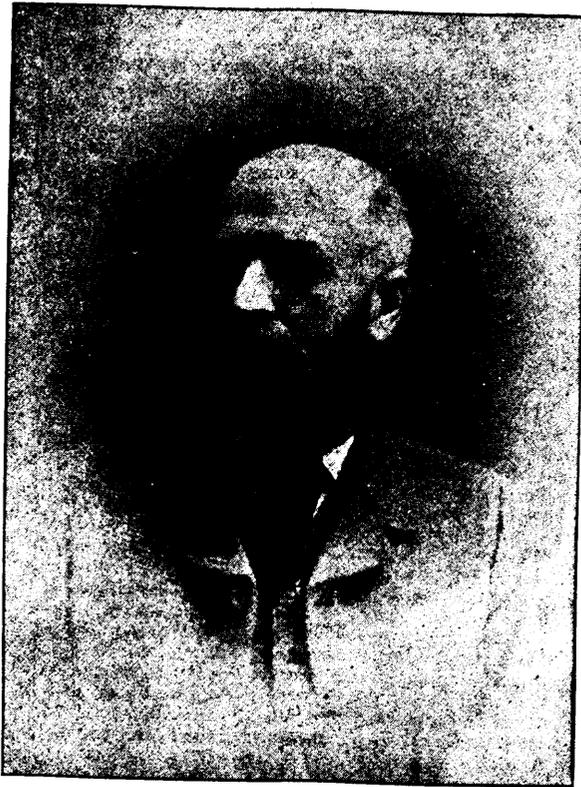
No. 6.

Capt. Thomas H. Tretheway, Port Arthur, Ont.

The subject of our sketch was born in St. Stevens' Parish, Cornwall, England, on the 22nd day of December, 1841. He is the eldest son of James Tretheway, the miner, of the same place, and is a living exemplification of what integrity, perseverance and intelligence faithfully applied, will do for any man who marks out for himself a course, the beacon star of which is to render the most faithful and honest service in his power to his employers, no matter in what capacity he may serve. He is closely identified with the progress and advancement of the district of Algoma, both by land and water, having served the early settlers on both elements, through many years of its early history, and the name "Capt. Tom" is familiar in every household from Thunder Bay, on Lake Superior, to the Bruce Mines on Lake Huron. He has not always confined his attention to mining, having at different periods in his history been a master of construction on public works, such as breakwaters, docks, etc. He followed a seafaring life during several summers on the Great Lakes, rising steadily, from "before the mast," to be master of several different steam and sailing vessels. At present he holds a master's certificate, entitling him to take command of any passenger or freight-carrying vessel, steam or sail, plying on the great inland waters. He also holds a certificate as a third-class marine engineer. So that it may readily be seen that no matter what the nature of the employment might be his one object was to excel and thereby gain the top rung of the ladder. With regard to his connection with mining it need only be said, that from sorting ore, up to being superintendent, he always gave eminent satisfaction. He has three sons growing up perfect imitations of their father. The eldest is 23 years of age, and is a competent assayer. He had charge of all machinery, including the repairing of drills and pumps underground, and the erection of two hoisting engines, one compressor and four steam pumps at the Shuniah Weachu mines. He improved the pumps so that they condensed their own steam, by turning the exhaust steam into the suction pipe of the pump, thereby increasing the power of the pumps from 10 to 20 per cent. and saving the company a proportionate amount. An incident in the early life of Capt. Tretheway well illustrates the character of the man. He was employed doing some work for his father, and was chided by him, in the old Cornish fashion, "that

he would never be as good a man as his father." He answered "yes I shall, and a better, and some day have charge of all your other sons." Four years after this he was in charge of The Roberts Coal Mine, at Salineville, Ohio, at which time his father and brothers were employed under him.

The subject of our sketch emigrated to Canada in company with his parents. The family landed in Quebec in the summer of 1848, and proceeded westward by river and lake, and settled at Port Hope, Ont. His father was given charge of the Grand Trunk Railway Company's quarries between Cobourg and Toronto. During his residence in Port Hope our subject enjoyed the only schooling it was his privilege to receive during life, and then only for a period of about two years, for as soon as he was able,



like many others of Canada's sons in those early days, he was, from force of circumstances, compelled to labor for his daily bread. He continued to work in and about the quarries until the summer of 1858, when the family again joined the stream of emigration flowing westward through Canada, and settled at Bruce mines, Algoma.

He was then 17 years of age and went to work in the jiggling houses of the West Canada Mining Company, of which the late Wm. Plummer, M.E., was then Superintendent, and James Bennets, Manager. The company operated the Wellington and Huron Copper Bay properties, which were adjacent to and a continuation of the veins of the old Bruce Mines, which were operated by the Montreal Mining Company. This group of mines may be said to have been

the cradle of the mining industry in Western Canada, and in it our young friend was nurtured up to the years of early manhood. In 1850, Capt. Richard Wallis, of the North-West Mine, Keewenan County, Mich., engaged him to go to the then northern wilds of Michigan, on the south shore of Lake Superior, where he worked as a miner, timberman and shaft foreman for a period of two years. Later, under the superintendence of S. W. Hill, he was employed by the same company as an explorer, on the property which is now known as the Delaware and Pennsylvania Mine. He was thus employed for two years, when he returned to the Bruce Mines, and worked as a tributer at the Bruce, Wellington and Copper Bay mines. In 1863 he removed to Woodville, near Jackson Mich., and entered the employ of the Woodville Coal Mining Company as a coal miner, and in that capacity advanced very rapidly to a front rank. He was then engaged by Roberts & Co., coal miners of Cleveland, Ohio, to take charge of their works and open up their coal properties at Salinville, Columbiana Co., Ohio. He performed this work in the most satisfactory manner. In addition to opening the mine, it included the building of half a mile of railway and three-quarters of a mile of tram-road. He once more turned his steps towards Bruce Mines and entered the employ of the West Canada Mining Company as manager of the jiggling houses. His somewhat restless disposition induced him to adopt a seafaring life on the lakes during the summers, where he evinced the same aptitude that he already had at mining, exploring and works of construction. By his energy and economy he soon became the owner of vessel property. He was master and owner of the schooner *Warner* and other vessels well known to the older residents of Algoma, trading on Lakes Huron, Superior and Georgian Bay. In 1871 he was sent to Thunder Bay, now Port Arthur, by Thomas Marks & Bro. to superintend the construction of

two stores, a dock and warehouse. In 1873 he was given charge of a portion of the work on the Government dock, then under construction. He was then employed as a master dock builder and had charge of the erection of machinery at the famous "3A" mine, and at Jarvis Island Mine, in each of which cases he received a considerable bonus for the satisfactory way in which he performed the work. He again took to sailing, and was master of the steamers *A. Neff*, *Watchman* and *Kate Marks*. In 1880 he entered the employ of the Silver Islet Consolidated Mining and Land Company, first at rebuilding the tugs and scows used in transporting the ore from the islet to the mill on the mainland. He was then given charge of the construction of 200 feet of breakwater at the most exposed part of Silver Islet. This piece of work still

stands, and is apparently as good as when constructed. At this time he was promoted to the position of underground captain, and had charge of all underground work, including the sinking of the new shaft from the surface down to the ninth level. During this period he had charge of the construction at this mine of the first skip road ever built on the North Shore of Lake Superior. In 1882 he was given the superintendency of the company's works at Cape Maimase, Lake Superior. He remained there till the company closed its operations.

He then entered the employ of D. McDonald & Co. at Port Arthur, and was given charge of construction on the Port Arthur breakwater, and sank the first twenty cribs. He was then employed by George H. Macdonnell, of the same firm, to open up a Baryta mine on McKellar's Island. Work was suspended there in the fall of 1886, and on the formation of the Shuniah Weachu Mines Company, of Liverpool, Eng., he was engaged by them as underground captain at their mine at Silver Mountain. In the following year he was promoted to the superintendency of the company's entire works, and remained as such up to the 15th May, 1890. While employed here he did all the assaying for the mine. On his retirement he was presented with a cash bonus and testimonials from the company, couched in the warmest terms of appreciation.

During his superintendence at this mine he was frequently engaged by owners of mining properties to examine and report upon them as to the advisability of development, etc., and although he received such a limited education in his youth, his reports are second to none, and will compare favourably with those of men with half the alphabet after their names.

On the first day of June of this year he again entered the employ of the Silver Islet Consolidated Mining and Land Company as superintendent of the company's works, including Silver Islet, Edward's Islet, Cape Gargantua and Cape Maimase, all of which properties are again being opened by the company.

The Opening Meeting of the Iron and Steel Institute.

The first day's session of the British Iron and Steel Institute opened at New York on October 1st, in Chickering hall. The attendance was very large. The foreign delegates predominated in numbers, but quite a number of the American Institute of Mining Engineers were present. Sir James Kittson, President of the B. I. and S. Institute, was in the chair, and called the meeting to order.

Mr. ANDREW CARNEGIE delivered an address of welcome, to which Sir James responded.

Gen. SHERMAN received quite an ovation as he was being escorted to a seat on the platform.

Sir JAMES KITTSON then said it was intended to present a diploma of membership and a gold medal to the Hon. A. S. Hewitt, but he was not present owing to illness, so the presentation was not made.

Mr. HEWITT'S speech was then given out to those present in printed form.

The first paper read was "The Development of American Blast Furnaces," by Jas. Gayly, of Bessemer, Pa.

Sir LOWTHIAN BELL then read a paper treating on the effect of more or less carbonic acid in furnaces.

INVITATION TO VISIT ONTARIO.

Sir JAMES KITTSON then introduced Mr. Archibald

Blue, the chief of the Statistical Department of Ontario, who addressed the Institute as follows:—

Sir James Kittson and gentlemen of the Iron and Steel Institute,—I have come at the instance of the Government of Ontario, whose officer and servant I am, to extend to you an invitation to visit that important Canadian commonwealth before you return home. Word has reached the Government that some of your number purpose passing through our country on their way down from the mining regions of Minnesota, Wisconsin and Michigan, and that a short stay is likely to be made at the nickel and copper mines of Sudbury. An earnest hope is entertained not only that they may be led to prolong their stay in Ontario and extend their visit to other mineral districts, but also that the whole body of the Institute may be prevailed to come and do likewise. It is recognized, I ought to say, that your Institute has come to America at this time at the generous invitation of the American Institute of Mining Engineers, and that you are here as the guests of that body. But on the membership roll of that association there are a goodly number of Canadians, one of its latest and best meetings has been in the capital city of the Dominion, its name embraces the continent, and it is international in aim as well as in name and complexion. Rather, it is cosmopolitan, as all science is, and therefore not cribbed or confined in the sphere of its interests by State or continental limitations. And so the Government which I have the honor to represent trusts and believes that it will not be regarded as an intruder when it sends cordial greeting to the members of the Iron and Steel Institute, and invites them to see Ontario and spy out some part of its mineral wealth before they have completed the American tour. It would be a pleasure to the Government to have an opportunity of showing civilities to the members of the Institute, representing as they do one of the greatest of the great industries of the Mother Land; and I am also authorized to state that in this agreeable undertaking the Government will be heartily joined by the Board of Trade of the city of Toronto, the strongest and most representative organization of the kind in Canada. You, gentlemen, are specially interested in iron and the supply of iron ores. You are now to a large extent dependent on foreign countries for the qualities of ores needed in the production of steel, and it may concern you to know that in Ontario we have immense ranges of iron ores, mostly of the magnetic variety, touched as yet only by the hammer of the prospector, and waiting for enterprise and capital to develop them and convert them into the best grades of iron and steel. You are expected to visit the famous Vermilion range in northern Minnesota, the annual output of whose mines has risen in five years from a few thousand to more than half a million tons. Well, sixty miles away, in the Province of Ontario, we have the same geological formation, and extensive ore bodies have recently been discovered there, while a hundred miles to the north-westward, midway between Lake Superior and Lake of the Woods, there is a mountain of rich magnetic ore, several miles in length, and claimed to be well suited for the production of Bessemer steel. We have also large bodies of clean magnetic ores in the eastern part of the Province, and others not so clean; but after the demonstration witnessed on this platform two days ago there is little fear, I think, but that the ingenuity of man will succeed in exorcising the evil. To the British ironmasters, some of the greatest of whom are here present, a brief statement of these facts may not be without interest or value even if they cannot all at this time be persuaded to come, and see, and know for themselves.

There is, however, another reason why the Government of Ontario and the Toronto Board of Trade desire that the Institute should accept an invitation. You have heard something of the existence of nickel ore in our province, and it is proposed, I understand, to spend a few hours at the mines and smelting works of the Canadian Copper Company of Cleveland, Ohio, the Hussey-Vivian Company of Wales, and the Dominion Mineral Company of Canada, all of which are in the vicinity of Sudbury. The experiments of Riley and Hall with nickel and steel are familiar to members of the Institute, for they were luminously presented by these gentlemen at your meeting of May last year. Since then, as I happen to know, these experiments have received the careful attention of one high in the counsels of the Government of the United States, and promptly following the tests upon armor plates made at the Annapolis navy yard a few days ago we saw nickel placed on the free list and a million dollars voted by Congress to purchase a supply of the metal, to be used in the manufacture of nickel steel for plating the new battle-ships. Here in the United States the impression appears to prevail that the ore exists in very limited quantities, and that unless it is at once secured a more favoured nation may get in ahead and take all. It is therefore pardonable in the members of the Iron and Steel Institute, living about 4,000 miles away, if they are no better informed than our neighbours on the extent of Ontario's resources in nickel ore. The fact is we do not know their exact extent ourselves. But we do know that great ranges of ore have been discovered over an area of several hundred square miles, and from

its occurrence in a particular formation we have reason to believe that it exists throughout a region several thousand square miles in extent, a vast portion of which is an unbroken wilderness, untrudged by the foot of man. It is never safe to prophesy unless you know, but I verily believe we have enough nickel ore in the Huronian rocks north of the Georgian Bay to plate the navies of the world for a thousand years, and to serve many other and better purposes besides,—assuming, of course, that the metal can be economically separated from its compounds, and there is barely a doubt that it can. No other colony of the British Empire is the equal of Ontario in agricultural capabilities, and in hewing farmsteads out of the woods, Britain's sons have done a great work there since 60 years ago. They came to us for the most part without other capital than stout hearts and willing hands, and in their chosen occupation they showed what British pluck and intellect have done in every calling of life, in every corner of the earth. We are making an effort at the present time to get more men of the same class, and we have room for many more. We have 200,000 square miles in Ontario, of which hardly the half has yet been occupied. What remains lies for the most part within the Laurentian, Huronian and Animikian belts, in which there are numerous occurrences of gold, silver, iron, nickel, copper and apatite, and hence more attractive to the miner and metallurgist than to the farmer. In nickel and iron ores it is especially rich, and we think that the time is opportune for the British ironmaster to seek to do there in his own industry what the British farmer and settler have so successfully done in agriculture. We are fellow-citizens with you, and where our institutions differ from those of the United Kingdom we believe they differ not for worse but for better. Sometimes we have thought that in your enterprises and investments you have shown greater partiality to the older son, Jonathon, than to the younger, Johnny Canuck. But we recognize the laws which govern business operations, and we do not doubt that success will come to those who work and wait for it, if they are worthy of it. We are living on excellent terms with Brother Jonathan, in spite of seeming rivalries at Ottawa and Washington in the building of tariff walls, and we have some of his capital and skill employed in utilizing our mineral wealth. But much more is needed, and if abounding deposits of iron and nickel ores are a temptation to the gentlemen of the Iron and Steel Institute, I know that I can give to them for the Government of the Province of Ontario and the Board of Trade of the city of Toronto the assurance of a kind and hearty welcome to the country of the great lakes.

AN INVITATION FROM THE DOMINION GOVERNMENT.

At the conclusion of Mr. Blue's remarks the institute was addressed by Dr. Selwyn, chief of the Geological Survey of Canada, who conveyed an invitation from the Dominion Government to the members to visit Ottawa and other portions of the Dominion.

Both invitations were most heartily received. Subsequently a conference was held by a large number of the delegates who desired to visit Canada with a number of Canadians present, consisting of Mr. Blue, Dr. Selwyn, Mr. Henry W. Darling, and Mr. Erastus Wiman. It was arranged that as the members of the institute would be compelled to adhere to a programme, the visit to Canada would have to be made after that of Washington. Under existing arrangements they will reach Sudbury Junction on the 23rd of October, Niagara Falls on the 24th (at which point they are to be entertained at luncheon by Mr. Wiman), then to Washington, where they are to be presented to the President. On the 26th and 27th they will return to New York, and from there go to Canada via Niagara Falls, say about the 29th or 30th of October. The number who have thus far expressed a determination to visit Ottawa is about one hundred. As they will not sail from New York until November 8th by the Etruria, they will have nearly a week to spend in Canada.

Annual Meeting of the Newfoundland Colonization and Mining Company (Limited).

The shareholders of this Company held their ordinary general meeting last month, at Winchester House, Old Broad Street, London, E.C., Mr. Charles Clark presiding.

The directors presented the following report:—"The directors herewith submit to the shareholders the accounts made up from the incorporation of the Company to June 30th, 1890. The directors, anticipating that the shareholders would like the latest information, have arranged that Mr. Wingfield Bonnyng, the general manager, shall attend the meeting, when he will give a detailed account of the present position and future prospects of the Company's operations in Newfoundland. It will be seen that the sum of £4,024 4s. 3d. has been spent in developing the La Manche lead mine, which has been vigorously pushed forward, and is now sufficiently opened up to enable the directors to consider the policy of selling the

mine, or of forming a subsidiary company to acquire their mining rights, in the shares of which they would retain a large interest, so that the shareholders of this Company might participate in eventual profits without further outlay of capital on their part. Owing to the unsettled state of the Western part of Newfoundland in connection with the fishery disputes, no work has been done on the Company's St. George's Bay grants, either in the way of prospecting or clearing land for colonisation; and the directors consider it would be undesirable to attempt this until the respective Governments have arrived at an amicable settlement of the matters in dispute. In accordance with the statement made in the circular of April 27th, 1889, Lord Thurlow accepted the chairmanship of the Company, but finding that he was unable to devote to it the amount of time which he felt it required, he subsequently retired from the board. He retains, however, his large stake in the concern, and continues to take a warm interest in the affairs of the Company. At the suggestion of a large number of shareholders in the West of England, Mr. W. W. Baker, of Bristol, was elected to a seat on the board. It will be necessary for the shareholders to appoint an auditor for the ensuing year; Mr. H. Cattley Stewart, who has audited the accounts for the past year, offers himself for election."

The Chairman, in moving the adoption of the report, after expressing regret at the retirement of Lord Thurlow from the board, said that in Mr. Bonnyn's report in November, 1888, £20,000 was mentioned as the estimate of the sum which ought to be raised in order to carry on operations satisfactorily, and that the directors gave them a promise that unless they saw their way to at least £10,000 they would not proceed to allotment. Having secured that minimum, and something more, to begin with, they were led to hope that a larger amount might gradually be obtained, and their best efforts had been put forth to obtain that. But, in common with many other companies which sought support from the public last year, they found that the desired additional capital was not forthcoming, and their total subscriptions up to the present time amounted to only £11,400. The shareholders would remember that in the same report Mr. Bonnyn called special attention to the La Manche lead mine as the enterprise offering the best prospects of early profit, and recommended that they should at once proceed to put it in such condition as would afford them the choice of either continuing to work it on their own account or selling it at a price which, in addition to recouping, might provide the capital required for their operations. That was the policy on which they had been acting, but they confessed that they were disappointed that they were not yet actually returning ore. The coal seams and the rock-salt upper crust could be generally developed as sufficient capital became available. Negotiations were in progress for leasing to a responsible firm in Nova Scotia the Company's timber-cutting right over 12,000 acres of forest land in the Gander Lake district on very advantageous terms. The board proposed to commence colonisation in the St. George's Bay district, but the unsettled state of matters in this region of the island through the fishery disputes had prevented any progress. The Chairman concluded by referring to the railways now in course of construction near the property of the Company.

Mr. W. H. Wilson seconded the motion.

Mr. Bonnyn (the general manager) having addressed the shareholders at some length with regard to the prospects of the Company, the report was adopted.

A Brave Miner.

Few pleasanter tasks fall to the lot of the journalist, says the *Pall Mall Gazette*, than that of recording those acts of heroism and self-sacrifice which from time to time brighten the most commonplace toil. There is not just now any great war, in which

many a darkness into the light can leap,
And shine in the sudden making of splendid names.

But these "special names" can be, and are, made all the same. Scarcely a day passes in which some brave soul does not meet danger and death in the service of mankind; hardly a week goes by without showing abundantly that the spirit of self-sacrifice still exists, and that it only requires opportunity to turn the dull round of many an humble life into splendid heroism. At Haydock, the other day, it was found necessary to sink a furnace-pit, in connection with what is known as a Queen Pit. Only very few men can work in such a pit at the same time, and operations can only be carried on continuously by the employment of gangs. The work naturally entails a good deal of blasting, and, failing the electric battery, which ought always to be used in such cases, the fuse has to be lit by hand. It does not need a very vivid imagination to picture an occasion when, for some untoward reason or another, the men are unable to leave the pits, and have to calculate their remaining moments of existence by the rate at which the powder of the fuse burns away. It was an occasion such as this which drew forth the heroism of

Richard Gill. Three men went down into the furnace-pit at ten o'clock at night. One of them was Richard Gill, the hero of this narrative, a man 44 years of age, living at Stone-row, Haydock. They started work, and about an hour after midnight their charges were all laid, and nothing remained but to light the fuse and leave the pit. The workmen are raised by means of a hoppet, which a steam-engine lifts or lowers as required. Upon the rope of this hoppet hang, literally, the lives of the men engaged at work in the pit. If, when the fuse is lit, the rope should break, or anything go wrong with the apparatus, certain death must be the doom of those below. Hence great care is taken to prepare the engine man for the crucial moment. A bell is rung five times in order that he may get ready, and then, when the fuse which conveys fire to the deadly charge is lighted, one final ring informs the engine driver that the men must, without a moment's delay, be drawn up. On the occasion in question Gill rang the bell. The engine man having thus been ordered to get ready, there was a pause while the men stood ready to apply the match. Everything seemed all right and the fuses were lit. Hurriedly taking their places in the hoppet, they once more touched the bell and gave the signal to hoist. But the hoppet did not move. And then, all at once, it flashed across Gill's mind that he had only rung the bell four times. There was not a moment to be lost. Fearing that the engine-driver had not understood the signal, he rushed from the hoppet and frantically cut at the fuses. One of the four had yielded to the knife, when to the horror of the men who remained in the hoppet, the rope tightened and they began to move. Slowly, but surely, the hoppet rose, leaving poor Gill alone, face to face with death. There was but one chance. They might ring to have it lowered again; and all three might yet reach the top in safety. The brave man's brave companions saw this, and shouted to him to ring that it might be lowered. But, standing near the fuses as he did, Gill could see that the explosion would not much longer be delayed. It was a question whether he should die alone or whether he should force his companions to share his fate. He decided without hesitation. "Go on," he cried; "better one should die than all three. Good-bye!" The hoppet disappeared and Gill was left to meet death alone. Help on earth there was none. To whom could he turn? His two companions, according to the newspaper account, "Distinctly heard Gill praying." But "short time had he for shift or prayer;" for, ere the hoppet could reach the top, the explosion had taken place. The hero was afterwards found lying on the ground close to the place where he had cut off the fuse. "He was," says the newspaper account, "terribly injured, his skull being fearfully fractured." But he was not unconscious. He remembered what had taken place, and he could still speak. His words were few, but characteristic. He blamed no one, nor did he repine at his accident. "It was my own fault," was all he said. "The ambulance was got," concludes one reporter, simply, "and Gill conveyed to the Haydock Cottage Hospital, where he now lies in a very precarious condition. He is not expected to recover."

Unions and Strikes.

At a recent meeting of the Church Congress, held at Hull, England Mr. David Dale, of Darlington, in a paper, said that circumstances had forced upon him an intimate participation in the various modes by which, during the past twenty-five years, the terms and conditions of labor had been settled in the great industries of Durham and the North Riding of Yorkshire, and he confined himself to the results of actual experience. The first difficulty experienced in seeking to bring about a peaceful solution of the labor questions had arisen from the reluctance of employers and of influential public opinion to recognise the justification of a men's union. But, while regarding unions as useful in proportion to their numerical strength, he disapproved of the employer being made to compel men to join a union. To admit his right to do so was to admit the converse right to say, "You must not belong to a union." Where the existence or influence of a union was sustained by pressure of this sort, there was some inherent weakness in its constitution or management, for the individual worker was wonderfully ready to disregard his immediate personal interests when they seemed to be at variance with the permanent interests of his class. Much had been heard of the folly and wickedness of strikes, on account of the misery they entailed; but there was another aspect in the heroism which accepted suffering for future advantage, and renounced what was easiest for a common cause. With such feeling to work upon, it was unwise to apply compulsion to non-adherents. Then employers objected to negotiate with men who had not been, or who had ceased to be employed in the industry they represented. The scale of industrial enterprise rendered it necessary that the affairs of an important union should absorb the whole time of paid officers. The Durham Miners' Association utilised

properly the services of four capable and intelligent agents. The acceptance of the functions of umpire by men of distinction was amply justified by the vastness of the interest at stake. In many industries wages could be regulated by a sliding-scale; and this had much to recommend it where the wages had varied in some steady relation to the selling price of the commodity produced. The plan furnished to the workmen absolutely reliable information, usually extracted by public accountants from the books of the employers. Sliding-scales had worked well for many years in the pig iron trade and the manufactured iron trade of the north of England, in the coal industries of Durham and Northumberland, in the ironstone mines of Cleveland, in South Wales, and in many other important localities and trades. In some industries workmen had terminated them without assigning definite reason; but they well deserved consideration as a machinery tending to secure, promptly and automatically, an adaptation of wages to varying conditions of trade. Sometimes the road of peaceful arrangement was abandoned by a new generation of workmen who had not inherited their fathers' experience of how much more was to be gained by negotiation than by strife. This, may be, led to conflicts until the new generation gained its own experience, but their education would not take so long as did that of their fathers. The retrograde movement resembled the receding wave in an advancing tide. Till recently the Church had shared the feeling that organised labor movements represented unreasonable unrest and revolt against authority, and its precept was, "Servants, obey your masters in all things." But now it was recognised that there are reasonable claims below the surface exhibiting extravagant language, accompanied in some cases by unjustifiable action. Naturally, the clergy—having no special means to probe the depths of industrial questions—had been impressed chiefly by those incidents and views which the Press in earlier time gave prominence to. Now the attitude of the Church was one of broad general sympathy with the aspirations of labour to secure conditions which would admit of life being more than a struggle for existence. It regarded organisations for this object as justifiable and needful agencies. It would say that freedom of individual action should be inculcated, with a sympathetic recognition of the natural feeling on the part of those who joined a union that those who do not are going to take advantage of what is gained without contributing to the effort or sacrifice of seeking it. On the other hand, we should not pass from the former assumption that the employer must be right to the contrary assumption that the employer must be wrong. Let both parties be united in an honest desire to be candid and reasonable, but with a perfect knowledge or appreciation of each other's claims. The cases were rare in which it was expected for the representative of the Church to proffer mediation; his function was rather to cultivate those Christian virtues which tend to avert strife, but to do it with an intelligent knowledge of modern industrial conditions and of the special rights and obligations that attach to them.

Coal Mining in Natal

A Natal correspondent writing to the *Colliery Guardian* says:—"Having gone up the river beyond Ladysmith to see the Biggersberg extension, I thought it would be a good opportunity to visit the various coalfields in the colony, as all of them, with the exception of Ingagane and Newcastle, are situated on the line of railway extension recently completed, or within easy reach of it. Coal-mining in Natal on an important and systematic plan was commenced so recently that the history of the workings of any company is necessarily a brief one. Coal was known to be in existence on the ground now worked by the Elandslaagte Company for many years, and as a matter of fact coal was mined there by the military during the Zulu War. Then the Elandslaagte Company—a private concern by the way—was found to mine for coal there. They sunk a shaft just above the spot where the military mined, but the coal extracted was found to be of very inferior quality—in fact, it was taken from too near the shaft to be of much value—so the shaft was ultimately abandoned. Another shaft was then opened further west, and a considerable quantity of coal was taken from it. Up to the present time seven shafts have been sunk by the company altogether. When I visited the mines only two shafts were being worked out of the seven existing. The hands employed by the company are 110 natives, 35 Indians, 6 Europeans, 1 Creole. The company make their own cages, wagons for use underground, and other appliances on the spot, a smithy and carpenter's shop being in operation for the purpose. Sidings are run from the railway right up to the mouths of the shafts, and as the wagons full of coal are brought up from the mine on to the elevated platform, they are run along to a tipping apparatus at the other end, and their contents emptied at once into the railway trucks, passing over a screen in their descent. The coal is further picked over as it falls into the trucks, so that any shale

may be cast aside. The output of coal in the last week up to the time of writing from the two shafts being worked was 411 tons, and the output during the present month is expected to be about 2,000 tons. Coal of better quality than that present being mined has been taken from another shaft recently sunk on the company's ground. The property is shortly to be tested for deeper seams of coal by means of the second diamond drill, which arrived in the colony a short time ago, and is about to be erected 800 yards north-west of shaft B, under the superintendence of Mr. J. Thompson, who up to the present has had charge of the old drill. Most of the plant is already on the ground, but one or two parts have gone astray up the line, and difficulty is also being experienced in obtaining labor to transport the remainder of the plant from the station to the site. Still, it is hoped the drill will be in operation in the course of two or three weeks. The drill is exactly similar to the one that has been to work at some time on the coast. Mr. Thompson was good enough to explain its working to me. The drills, or crowns, used vary in diameter from 7 in. to 3 in., according to the depth at which they are worked. When near the surface the larger drill is used, and smaller ones are affixed to the rods as the depths increase. The drill is driven by steam power and revolves at the rate of 300 revolutions per minute. The cutting power lies in the diamonds which are affixed in the drill, there being from three to nine of them. As the drill revolves the core of stone, coal, or other formation cut round, rises up the center of the tube to which the drill is fixed. I saw specimens as hard as the solid rock. When the drill has penetrated 10 ft. it is drawn up, the core is extracted, and the drilling is then recommenced. The diamonds in a drill may be worth as much as £130. Whistone is the most difficult stone found in Natal to work through, and Brazilian diamonds have to be used in cutting it, the Kimberley diamonds not being hard enough for the purpose. One of the most troublesome duties of Mr. Thompson is to fix the diamonds in the drill, the steel having to be cut away to fit the stones. The diamonds used are of a dark colour, and dull. The drill here is capable of penetrating to a depth of 2,000 ft. But not half that depth of drilling is likely to be required in Natal.

Annotated List of Canadian Minerals.*

G. C. Hoffman, F. Inst. Chem., etc.

1. **ACADIALITE**.—The flesh-red, brownish-red, purplish-red and yellowish-red varieties of chabazite (which have been named Acadialite) are found at Partridge Island, Swan Creek and Two Islands (Cumberland Co.), in the Province of Nova Scotia.

2. **ACMITE**.—Forms an important constituent of some of the nepheline-syenites of Montreal (Hochelaga Co.) and Belœil (Rouville Co.), in the Province of Quebec.—Anal., B. J. Harrington, Trans. Roy. Soc. Can., vol. i, sec. iii, p. 81, 1882 and 1883.

3. **ACTINOLITE**.—A bed of actinolite, mingled with an asbestiform serpentine and talc, occurs in the Township of Bolton (Brome Co.), and a finely fibrous variety, without admixture, constitutes a bed in St. Francis (Beauce Co.), Province of Quebec.

4. **AGALMATOLITE**.—Of a greenish-white to olive-green color occurs in layers in an indurated clay-slate at St. Nicholas (Levis Co.); of a honey-yellow color, forming a thin bed in clay-slate, in the Parish of St. Francis (Beauce Co.), and of an amber-yellow, with chloritic slates, on Lake Memphramagog (Stanstead Co.), Province of Quebec.—Analyses, T. S. Hunt, Geol. Can., 1863, pp. 484, 485.

5. **AGATE**.—Many beautiful varieties are found in the trap regions of Nova Scotia; as on the shore extending from Sandy Cove to the head of St. Mary's Bay (Digby Co.); near Cape Blomidon in large blocks (King's Co.), and fine moss agates are met with at Cape Santé and at Scotch Bay (Kin's Co.), also at Two Islands (Cumberland Co.). Agates are found in abundance in the amygdaloids of Lake Superior, and sometimes of considerable size and beauty. They abound in rolled masses on the beaches of Michipicoten and St. Ignace Island, at Thunder Bay and elsewhere along the the shore of this Lake.—Province of Ontario.

6. **ALABASTER**.—Considerable masses of a very beautiful snow-white gypsum or alabaster are met with in the gypsum quarries of Hillsborough (Albert Co.), in the Province of New Brunswick.

7. **ALBERTITE**.—This beautiful mineral has, so far, only been met with in King's, Albert and Westmoreland Counties, the most important locality being in the Parish of Hillsborough (Albert Co.), in the Province of New Brunswick. It is not found in beds, but in true cutting veins, which, although at times coincident with the bedding, are as often oblique or at right angles to it. The chief deposits, those of the Albert mines (in Hillsborough), occur in highly bituminous and oil-bearing shales situated near or at the base of the lower Carboniferous; but, at points not widely separated, veins of the mineral are found penetrating, for short distances, the

underlying metamorphic rocks—supposed to be of Huronian age—and the overlying and little disturbed beds of the millstone grit. The maximum thickness of the vein as first found near the surface was twenty-two feet, that of the smaller veins only a few inches, while the veinlets were often not thicker than a sheet of paper. It is estimated that since its first discovery (by John Duffy in 1849) some 200,000 tons of this material have been raised at the Albert mines. The deposit has, however, now become practically exhausted, and the mine in consequence abandoned.—(From information communicated by Prof. L. W. Bailey, of the University of New Brunswick).

8. **ALBITE**.—Large cleavable masses of white albite, with quartz and mica, constitute a granite found at the Lake of Three Mountains, on the River Rouge, in the Township of Clyde (Ottawa Co.), and a faintly greyish-white, almost white, albite, exhibiting a fine bluish opalescence, occurs in large fragments in a coarse pegmatite vein—composed of quartz, muscovite, microcline, with occasionally black tourmaline, garnet, etc.—cutting a greyish garnetiferous gneiss, in the Township of Ville-neuve, also in Ottawa County, Province of Quebec. See also note to "Peristerite."

9. **ALLANITE**.—Small crystals of this mineral were found, by Dr. T. S. Hunt, in a felspathic rock near Bay St. Paul (Charlevoix Co.), and in a rock composed of labradorite and hypersthene from Lake St. John (Chicoutimi Co.), Province of Quebec. Also occurs (Prof. E. J. Chapman, Can. Jour., new series, vol. ix, p. 103, 1864) in the form of a narrow vein in granitoid strata at Hollow Lake, the head waters of the South Muskoka, in the Province of Ontario.

10. **ALMANDITE**.—The red garnet from the Stickeen and Skeena Rivers, as also many of the other red varieties alluded to under "Garnet," will, most probably, be found to be referable to this variety.

11. **ALUNITE**.—A massive, fine granular, light reddish-colored alunite, has been met with—associated with a greyish translucent quartz and specular iron—at New Ireland Road, Parish of Alma (Albert Co.) in the Province of New Brunswick.

12. **ALUNOGEN**.—Has been found, in the form of a crust of from 5 to 5½ cm. thick, on an old heap of shale at the Scotia mine, Springhill coal-field, Cumberland Co., Province of Nova Scotia.—Anal., F. D. Adams, Rep. Geol. Can., 1878-79, p. 8 H.

13. **AMAZON-STONE**.—Occurs abundantly, and of good color, in the Township of Sebastopol (Renfrew Co.), in the Province of Ontario. It has also been found in the pegmatite vein, referred to under "Albite," in the Township of Villeneuve, and is again met with in the Townships of Wakefield and Hull (Ottawa Co.), Province of Quebec.

14. **AMETHYST**.—Often of great beauty, is found at many places on the shores of Cumberland, King's, Annapolis and Digby Counties, Nova Scotia. The best localities are: Cape Sharp and Partridge Island (Cumberland Co.), Cape Blomidon (King's Co.), and Digby Neck (Digby Co.). Fine specimens occur in veins around Thunder Bay—more especially at Amethyst Harbor, and at the mouth of McKenzie's River—and at other points on the north shore of Lake Superior, Province of Ontario.

15. **AMPHIBOLE**.—See under "Actinolite," "Asbestos," "Hornblende," "Nephrite," "Pargasite," "Tremolite."

16. **ANALCITE**.—Fine specimens of this mineral are found at Cape d'Or, Swan Creek, and Two Islands (Cumberland Co.), also at Cape Blomidon (King's Co.), in the Province of Nova Scotia. It has been observed, in association with natrolite, in some of the dykes cutting the Trenton limestone at the reservoir extension, Montreal (Hochelaga Co.), in the Province of Quebec. Also occurs in the amygdaloidal traps of the north shore of Lake Superior, Province of Ontario.—Anal., B. J. Harrington, Rep. Geol. Can., 1877-78, p. 45 G.

17. **ANDALUSITE**.—Occurs in pale, flesh-red colored crystals in a fine grained micaceous schist at Moore's Mills (Charlotte Co.), Province of New Brunswick. Also found, in somewhat micaceous argillites, on Lake St. Francis (Beauce Co.), in the Province of Quebec. See also note to "Chistolite."

18. **ANDSITTE**.—Occurs in large striated, cleavable masses of a reddish color, with hypersthene and ilmenite, constituting a rock at Château Richer (Montmorency Co.), Province of Quebec. Analyses, T. S. Hunt., Geo. Can., 1863, p. 478.

19. **ANDRADITE**.—Is found in pale, yellowish, honey-yellow and brownish-yellow colored crystals, imbedded in chalcoppyrite, and in yellowish-green colored masses, in association with white fibrous tremolite and dolomite, at the Malaspina copper mine, northeast side of Texada Island, Province of British Columbia.

20. **ANHYDRITE**.—Is met with in considerable quantities, constituting beds, in the gypsum deposits of Nova Scotia and New Brunswick.

21. **ANIMIKITE** — **HUNTILITE** — **MACFARLANITE**.—The minerals thus designated occur at the Silver Islet mine, Lake Superior, Province of Ontario. The two first named were described by Dr. H. Wurtz (Eng. Min.

Journ., xxvii, pp. 55 and 124, 1879), the last by T. Macfarlane (Can. Nat., 2 ser., vol. iv, p. 463, 1870), the results of whose investigations of the foregoing are given in the Trans. Amer. Inst. Min. Eng., viii, p. 236, 1880. [The true nature of the individual minerals present in the Silver Islet ores is still to be determined, but there is probably present a silver arsenide (Huntelite), and perhaps also a silver antimonide (animikite) allied to dysersite—(Dana, Min., App. iii, p. 71, 1882.)

22. **ANKERITE**.—This is one of the most plentiful and characteristic of the minerals filling the numerous fissure veins occurring at the base of the southern slope of the Cobequid Mountains, Londonderry (Colchester Co.), Nova Scotia.—Analyses, H. Louis, Trans. N. S. Inst., vol. v, p. 49, 1879-82.

23. **ANORTHITE**.—This felspar is one of the component minerals of the coarsely crystalline intrusive diorite of Yamaska Mountain (Yamaska Co.), in the Province of Quebec.—Analyses, T. S. Hunt, Geol. Can., 1863, p. 479.

24. **ANTHRACITE**.—Of the carboniferous system is not known to occur in Canada; there are, however, deposits of this mineral, of cretaceous age, on the Queen Charlotte Island—the best known locality being at Cowgitz, on Skidegate Channel, at the southern end of Graham Island—Province of British Columbia. For reference to analyses, see under "Mineral Coal."

25. **ANTHRAXOLITE**.—This name has been given, by Prof. E. J. Chapman, but simply as a convenient term for present use, to the black combustible coal-like matter which is not unfrequently met with in the Provinces of Quebec and Ontario. He describes it as follows: Black, lustrous, resembling anthracite in general characters, but very brittle. Hardness equals 2.25—2.50; specific gravity, 1.35—1.55. Generally decrepitates when heated. Before the blowpipe a small fragment loses its lustre, but exhibits no further change. Composition, essentially carbon, with from 3—25 per cent. of volatile matter, including a small amount of moisture, and ash varying from 0—11 per cent. Exhibits under the microscope no trace of organic structure. Dr. T. S. Hunt, in speaking of this material, says: "It can scarcely be doubted but that it has resulted from the slow alteration of liquid bitumen in the fissures of the strata." This would explain the great variability in the percentage of volatile matter (exclusive of moisture) which is observed in specimens from different localities, the amount of alteration having in some instances proceeded further than in others. It never occurs in true beds like coal, but is found either lining fissures or filling veins and fissures, sometimes several inches in diameter, in the limestones, shales and sandstones, and even in the trap rocks which traverse these. Sometimes it occurs in buttons or drops, forming botryoidal masses. It has been met with in many places in the Province of Quebec, viz., on the Island of Orleans, at Quebec and Sillery (Quebec Co.), Point Lévis, and St. Nicholas (Lévis Co.), Lotbinière (Lotbinière Co.), Drummondville (Drummond Co.), Acton (Bagot Co.), in the vicinity of Chate River in Gaspé, and elsewhere. In the Province of Ontario it has been observed filling fissures in the chert beds among the upper copper-bearing rocks of Lake Superior.—Analyses, T. S. Hunt, Geol. Can., 1863, pp. 524—526.

26. **ANTIMONY, NATIVE**.—In a lamellar, or, more rarely, finely granular form, occurs, in association with stibnite, valentinite, senarmonite and kermesite, accompanied by quartz and a little brown-spar, in veins in argillite in the Township of South Ham, Wolfe County, Province of Quebec.

27. **APATITE**.—The variety fluor-apatite is very common in the Laurentian rocks of Canada, where it occurs both in the form of veins and of large irregular shaped deposits or lenticular masses. The most important deposits are in the township of Buckingham, Templeton, Portland and Wakefield (Ottawa County), in the Province of Quebec, but extensive deposits also occur in the townships of North and South Burgess and North Elmsley, in the Province of Ontario. This mineral also occurs in connection with crystalline limestone—being found in the form of olive-green terminated crystals, with rounded angles, together with grains of purple flourite, and crystals of black spinel, imbedded in a yellowish crystalline limestone, in the Township of Ross (Renfrew Co., Ont.); and crystals of blue apatite and quartz are imbedded in a coarsely cleavable, sky-blue calcite at the Calumet Falls (Pontiac Co., Que.). Small hexagonal prisms sometimes an inch in length and one or two lines in diameter, transparent, of a pink or purple color, with surfaces often dull, and angles rounded, occur, in association with crystals of augite, in an intrusive mass of fine grained, grey dolerite at St. Roch, on the Achigan River, L'Assomption County, Que.—Anal., T. S. Hunt, Rep. Geol. Can., 1863-66, pp. 203, on the composition of Canadian Apatites. G. C. Hoffmann, Geol., Can., 1877-78, p. p. 1-4H.

28. **APHRODITE**.—Is found filling fissures in the massive pyralloite of the Township of Grenville (Argenteuil Co.), in the Province of Quebec.—Anal., T. S. Hunt, Geol. Can., 1863, p. 473.

29. **APOPHYLLITE**.—Green and white crystals, aggregated in plates or in square prisms, occur at Two Islands

and Cape d'Or (Cumberland Co.), Blomidon (King's Co.), and Margaretville (Annapolis Co.), in the Province of Nova Scotia. Also, in foliated masses or plates, often of a red color, in association with calcite, on Prince's Location, Spar Island, Lake Superior, Province of Ontario.

30. ARGENTITE.—Occurs, with native silver, chalcocite sphalerite, etc., in a vein of calcite at Prince's mine; with native silver, in a vein of barite, celestite and calcite, on Jarvis Island; with native silver, sphalerite, and a little galenite and pyrite, in a vein of barite and calcite on McKellar's Island; and with sphalerite, pyrite, nicolite, etc., in a veinstone consisting of calc-spar, bitter-spar and quartz, on Silver Islet, Lake Superior. With native silver, in a gangue of calcite, at the Duncan mine—also at the Rabbit Mountain, Porcupine, Beaver and other mines in the district of Thunder Bay (Lake Superior), Province of Ontario.

31. ARQUERITE.—Is found with alluvial gold upon Vital and Silver Creeks, Omenica District, Province of British Columbia.—Anal., H. G. Hanks, Dana, Min., App. iii, p. 4, 1882.

32. ARRAGONITE.—Is met, in the form of acicular crystals, varying in size from microscopic minuteness to an inch or more in length, lining fissures or cavities in the ankerite, or implanted upon barite or calcite, in the ankerite deposits of Londonderry (Colchester Co.), Province of Nova Scotia. Has been observed forming stalactites and delicate fibrous masses in a calcareous rock in the township of Tring (Beauce Co.), Province of Quebec, and sparingly amongst the Lake Superior traps, Province of Ontario.

33. ARSENIC NATIVE.—Is found, in veins, seven miles up Watson Creek, west side of Fraser River, twenty-five miles above Lytton, Province of British Columbia.—Ann, Rep. Geol., Can., vol. ii, p. 9T, 1886.

34. ARSENOPIRYRITE.—Is of exceedingly common occurrence in the gold-bearing quartz bands of Nova Scotia. Is found, according to Dr. Hunt, well crystallized with galena in a quartz vein on the Chaudiere, in St. Francis, (Beauce Co.); and still more abundantly in small crystals, in association with galena, in a large vein of quartz on Moulton Hill, near Lennoxville (Sherbrooke Co.), Province of Quebec. Occurs in large quantities in quartzose veins in the township of Marmora (Hastings Co.), and it is also met with in the township of Tudor, in the same county, Province of Ontario.

35. ASBESTUS.—A more or less delicately fibrous variety of hornblende has been met with in the townships of Templeton and Buckingham (Ottawa Co.), Province of Quebec. In the latter township, mountain cork was found in quantity and in masses of considerable size at the Emerald phosphate mine. Mountain leather has also been met with in this township as well as at the Beaver mine in the township of O'Connor, District of Thunder Bay, in the Province of Ontario. The fibrous variety of serpentine, which constitutes a large proportion of what is known in commerce as asbestus, occurs in quantity in the eastern townships of the Province of Quebec.—See under "Chrysotile."

36. ASPHALTUM.—Occurs in the vicinity of Oil Creek, in the southern part of the township of Éniskillen (Lambton Co.), Province of Ontario, where it forms two layers of a viscid consistency, known as gum-beds, occupying areas of about an acre each in extent, and having a thickness varying from a few inches to two feet. Another bed of bitumen, of from two to four inches in thickness, is met with at Petrolia, in the northern part of the same township. The material of this bed, which is more solid than that of those just referred to, and mixed with a good deal of earthy matter, is readily separable into thin layers, which are soft and flexible. Very extensive deposits of a bituminous sand-rock occur for great distances along the banks of the lower Athabasca River, North-West Territory; these are described in Rep. Geol., Can., 1882-84, part C.C., and the results of the examination of the material appear in Rep. Geol., Can., 1880-82, p. 3H.

37. AUGITE.—Well-defined crystals of black augite are found imbedded in the dolerites of Montreal (Hochelega Co.), Rougemont (Rouville Co.), and Montarville (Chambly Co.) Mountains, in the Province of Quebec.—Anal., T. S. Hunt, Geol. Can., 1863, p. 468.

38. AXINITE.—Is said by Dr. Bigsby to have been found, in fine crystals lining a cavity in a boulder of primitive rock, at Hawkesbury (Prescott Co.), in the Province of Ontario. It has been found *in situ* by Dr. R. Bell, in small veins in trap, on the east coast of Hudson Bay, about one mile and a half south of the mouth of Little Whale River. Here it occurs, of a purplish-brown color, in association with epidote, imbedded in a matrix of calcite with a little quartz.

39. AZURITE.—Has, so far, not been met with in characteristic specimens, but merely as an incrustation on copper-ores, or in the form of stains and small earthy masses in copper-holding rock. Among the many localities where it has been observed may be mentioned: The Prince of Wales mine, Upton (Bagot Co.), and at the Black River mine—in a drusy calcite, with sulphurets of copper in the form of small crystals—St. Flavien (Lot-

binière Co.), Province of Quebec. With green carbonate of copper at Batchewanung Bay and Prince's mine, Lake Superior, Province of Ontario.

40. BARITE.—Occurs, sometimes in very beautiful crystalline masses, in numerous irregular veins or pockets in the slates of the East River of the Five Islands (Colchester Co.), Nova Scotia; in a vein cutting Laurentian limestone, in the Township of Hull (Ottawa Co.), Province of Quebec; and the following localities in the Province of Ontario, viz., the Township of Bathurst and North Burgess (Lanark Co.) McNab (Renfrew Co.), Dummer and Galway (Peterborough Co.), and Summer-ville (Victoria Co.); also, constituting large veins, on Jarvis, McKellar's and Pie Islands, Lake Superior. Red crystals, associated with purple fluorite, are found on Iron Island, Lake Nipissing; and isolated pale reddish-yellow crystals have been found by Prof. Chapman (Can. Jour., Nov., 1885), in veins, in the Township of Neebing, near Fort William, Thunder Bay, Lake Superior, and subsequently in other mineral veins in that region.

41. BENTHIERTITE.—Is mentioned (Dana, Minn., p. 68) as occurring near Fredericton, Province of New Brunswick. Prof. Bailey thinks the locality referred to would most probably be the autimony mine in the parish of Prince William, about twenty-five miles from Fredericton (York Co., N.B.).

42. BERYL.—Crystals of this mineral, having a diameter of three inches and more, and a length of from twelve to fifteen inches, have been met with, by Abbé J. C. K. Lafamme, in the township of Jonquière (Chicoutimi Co.), and it has also been found in the township of Brassard (Berthier Co.), Province of Quebec.

43. BIOTITE.—A dark bottle-green mica from Moore's slide (Roche-Fendue channel) on the Ottawa River, has been referred to this species.

44. BISMUTH NATIVE.—Was recognized by Prof. Chapman in some rolled pieces of quartz from near Echo Lake, on the north-west shore of Lake Huron, and agreeably with the observations of Dr. Hunt, it also occurs, in traces, in a veinstone in the township of Tudor (Hastings Co.), Province of Ontario.

45. BISMUTHINITE.—Has been met with, in small lamellar and sub-fibrous masses in a quartz vein at Hill's mine, in the rear of Tudor township, Hastings County, Province of Ontario.

46. BISMUTITE.—Has been recognized, by Dr. Hunt, as occurring in a quartz vein at Hill's mine, in the rear of the township of Tudor, Hastings County, Province of Ontario.

47. BITUMINOUS COAL.—Of the carboniferous formation occurs in the provinces of New Brunswick and Nova Scotia. In the former, though covering a large surface area, more than two-thirds of the entire extent of the province, the carboniferous or coal-bearing rocks have afforded as yet but little promise of large or valuable deposits, and with the exception of the beds at Grand Lake in Queen's County, which are about two feet in thickness, no stratum of bituminous coal, sufficiently large or pure to be profitably worked, has as yet been discovered. In the Province of Nova Scotia there are three important coal basins, viz., those of Cape Breton, Pictou and Cumberland counties—the first mentioned occupying an area of at least 190 square miles, with a thickness of not less than 7,000 feet of the carboniferous strata; the second occupies an area of only some 22 square miles, but several of the coal seams are of extraordinary thickness; the area of the Cumberland field is likewise small, but includes several good coal seams. Coal is not found in the Provinces of Quebec and Ontario; the black combustible coal-like matter referred to under "Anthracolite" is, however, met with in small quantity at various localities in both these provinces. In the North-West Territory, in the Rocky Mountains, and in the adjacent foot hills, there are extensive deposits of a bituminous coal which, although of Cretaceous age, is in all respects—physical character and chemical composition—undistinguishable from coal of the Carboniferous, and the same may be said of the coal of the extensive and important deposits, also of the Cretaceous age, which exist in various parts of British Columbia. For reference to analyses, see under "Mineral Coal."

48. BOG IRON ORE.—Occurs in great abundance at numerous localities in the Provinces of Quebec and Ontario. In the former, the most important sites are in the Three Rivers district, or between the rivers St. Maurice, Batiscan and St. Anne. Other deposits occur in the townships of Stanbridge, Farnham, Simpson, Ascot, Ireland, Eardley, Hull and Templeton—the seigniories of Vaudreuil, Lotbinière, Lauzon, St. Vallier and elsewhere. In Ontario it is met with, in greater or less quantity, in the townships of Charlotteville, Middleton, and Windham (Norfolk Co.), Cambden (Kent Co.), Bastard (Leeds Co.), etc.—Analyses, T. S. Hunt, Geol. Can., 1863, p. 510.

49. BORNITE.—Occurs, most commonly associated with chalcopyrite and chalcocite, in the townships of Cleveland and Melbourne (Richmond Co.), Acton (Bagot Co.), Leeds and Halifax (Megantic Co.), Sutton (Brome Co.), and elsewhere in this section of the Province of Quebec. It has been found at the West Canada Mines

on Lake Huron, also at some points on Lake Superior, in the Province of Ontario—and near the head of Salmon Arm of Jarvis inlet, and between that inlet and Howe Sound, Province of British Columbia.

50. BYTOWNITE.—The name given by Dr. Thompson to a greenish-white felspathic mineral found in a boulder, near By-Town (now the City of Ottawa), in the Province of Ontario,—and which has since been shown by Zirkel (Tsch. Min. Mitth., 1871, 61.) to be a mixture. An analysis of a portion of the specimen upon which Dr. Thompson founded the species is given by Dr. T. S. Hunt in the Geol. Can., 1863, p. 479.

51. CACHOLONG.—Beautiful specimens of this mineral are obtainable on the coast between Capes Split and Blomidon (King's Co.), in the Province of Nova Scotia.

52. CACOCALASITE.—The cacoclasite of Prof. H. C. Lewis (The Naturalist's Leisure Hour and Monthly Bulletin, A. E. Foote, No. 87, Exposition Extra, 1885), has quite recently been submitted to a careful re-examination by Dr. F. A. Genth, and shown not to be a good species.—Am. Journ. Sci., 3 ser., vol. xxxviii, p. 200, 1889.

53. CACOXENITE.—Has been observed by Dr. Harrington as occurring in the form of beautiful little yellow tufts on the walls of cavities in calcite at the pyrite deposit near Brockville, in Elizabethtown, Province of Ontario.

54. CALCAREOUS TUFF.—See note to "Travertine."

55. CALCITE.—Is found in large rhombohedral, also modified crystals, at Partridge Island (Cumberland Co.), and on the coast between Capes Split and Blomidon (King's Co.), and a very fine apple-green calcite is found at McKenzie's River (Inverness Co.), Province of Nova Scotia. A coarsely cleavable sky-blue calcite occurs at the Calumet Falls in Lichfield (Pontiac Co.), also in the township of Wakefield (Ottawa Co.), and a yellow, cleavable calcite, also a fibrous variety, in the township of Templeton (Ottawa Co.), Province of Quebec. A salmon-red, cleavable calcite in the township of Sebastopol, Renfrew County, in the Province of Ontario. Crystalline limestone, suitable for employment as marble, for architectural purposes, occurs in most, and is very abundant in some of the provinces of the Dominion. White, red, grey, brown and black (and various shades of these colors) varieties are met with respectively at:—St. Armand (Missisquoi Co.), Caughnawaga (LaPrairie Co.), Duds-well (Wolfe Co.), Point Claire (Jacques Cartier Co.), St. Dominique (Bagot Co.), St. Joseph (Beauce Co.), etc., in the Province of Quebec—and Arnprior (Renfrew Co.), Cornwall (Stormont Co.), L'Original (Prescott Co.), Pakenham (Lanark Co.), and elsewhere in the Province of Ontario. See notes to "Dog-tooth-spar," "Foetid calcite," "Iceland-spar," "Nail-head-spar," "Travertine." For a list of minerals of the Laurentian limestones, see report "On the Laurentian limestones of North America," by Dr. T. S. Hunt, Rep. Geol. Can., 1863-66, p. 181, *et seq.*

56. FOETID CALCITE.—A milk-white, cleavable, foetid calcite, forms a large bed in the township of Grenville, and is also met with in the adjoining township of Chatham (Argenteuil Co.), Province of Quebec.

57. CANCRINITE.—Occurs in the nepheline-syenites of Montreal (Hochelega Co.), and Beloeil (Rouville Co.), Province of Quebec.—Anal., B. J. Harrington, Trans. Roy. Soc. Can., vol. i, sec. iii, p. 81, 1882 and 1883.

58. CANNEL COAL.—Occurs at Little Glace Bay, Cape Breton, Province of Nova Scotia.—Anal., H. How, Phil. Mag., 4 ser., vol. xxxvii, p. 268, 1869.

59. CARNELIAN.—Is found at Blomidon (King's Co.), at Trout Cove (Digby Co.), and the north shore of Granville (Annapolis Co.), Province of Nova Scotia.

60. CASSITERITE.—Small quantities of this mineral, in the form of minute grains, were found to be associated with the Sperrylite obtained at the Vermillion Mine, in the township of Denison, District of Algoma, Province of Ontario.—(H. L. Wells, Am. Journ. Sci., 3 ser., vol. xxxvii, p. 68, 1889). Very small quantities of this mineral, in the form of minute crystals, have also been found by Dr. Genth (prov. com.) in some tailings from the Battery lead, Malaga gold mining district, Queen's County, Province of Nova Scotia.

61. CELESTITE.—Occurs in white translucent crystalline foliated masses, which are sometimes radiated, and often several inches in diameter, in the Black River or Trenton limestone of Kingston (Frontenac Co.), in large crystallized masses, semi-transparent and of a bluish or occasionally, in parts, pale reddish color, in a vein cutting Laurentian limestone in the township of Lansdown (Leeds Co.), in radiating fibrous masses, constituting a vein in the Laurentian strata of Bagot (Renfrew Co.); a red variety, in cavities in dolomite, at the forks of the Credit, township of Caledon (Peel Co.) Other localities in this Province (Ontario) are:—Owen Sound, Drummond and Grand Manitoulin Island (Lake Huron), etc.

62. CENTRALLASSITE.—Is found in trap of Triassic age near Black Rock (King's Co.), in the Province of Nova Scotia.—Anal., H. How, Ed. N. Phil. Jour., new series, vol. x, p. 84, 1859; Phil. Mag., 5 ser., vol. i, p. 128, 1876.

(To be Continued.)

Some Ontario Magnetites.

By T. D. Ledyard, Toronto, Canada.

Sir William Logan, our great geologist, predicted that Canada would become eventually one of the greatest iron-producing countries of the world. Although possessed of numberless deposits of iron-ore, we have not yet done much to verify this prediction. Causes can be found for our backwardness, the principal one being the want of a market. A glance at the map shows that the small population of Canada is too scattered to support extensive iron manufactures. Six good-sized iron-mines would supply the ore necessary to make all the iron and steel used in Canada, even if we used nothing but our own make instead of importing the greater portion, as we do at present. And distances in Canada are too great in proportion to the small consumption to encourage home manufactures on a large scale.

But while Canada is suffering for want of a market, many parts of the United States would be benefited by the free admission of Canadian ores. The Eastern States could get cheap ores from Quebec and Nova Scotia, and many Pennsylvania furnaces could obtain Bessemer ores from Ontario at much lower rates than they are now paying for imported foreign ores.

GEOLOGY OF THE ONTARIO IRON-DISTRICTS.

Dr. Robert Bell, Assistant Director of the Geological Survey of Canada, in his "Geology of Ontario," † says: "The name Huronian (derived from Lake Huron) was first given by the Geological Survey of Canada more than forty years ago, and has been adopted by geologists in other countries as universally as the term Laurentian, and is made to include all the rocks lying between the Laurentian below it and the Cambrian or earliest fossiliferous rocks above. Some of the rocks of the district stretching between the Counties of Lanark and Hastings in eastern Ontario, which were formerly included in the Laurentian series, are now believed by some to belong rather to the Huronian. An attempt has been made quite lately, among some American geologists, to restrict the name Huronian to rocks like some of those north of Lake Huron, although Sir William Logan and his colleagues, in introducing the term originally, described it as applying equally to the dark grayish and greenish schists, conglomerates, diorites, etc. The more extended investigations which have since been made in Canada and other parts of the world have confirmed the propriety and convenience of including under this name all the rocks which had been originally described as Huronian."

"The Huronian, as above defined, is the great metalliferous system of Ontario, as well as of northern Michigan and Minnesota, and hence its great importance in the economic geology of the country. The whole series is more or less metalliferous, but the various ores are not uniformly distributed, some occurring in one region or in some special stratum, while others may prevail in another section of country or in a different horizon in the series. Iron appears to occur most frequently in the lower or schistose portions of the Huronian system."

SOME MAGNETITE-DEPOSITS.

This paper will be confined to a short description of certain ores found in the Counties of Peterboro and Haliburton, and in the more easterly portions of the Province of Ontario. Those which will be mentioned are probably among the most important, yet comprise only a few of the ores which have come under the writer's notice. Magnetites only will be here taken into account, although hematites are found in these districts in deposits of considerable importance and sometimes of great purity.

Prof. E. J. Chapman, Ph.D., of the School of Science and University College, Toronto, says:

"This area of Ontario is traversed in a general north east and southwest direction by belts of elevated rocky land, consisting of unstratified, probably eruptive, syenites or syenitic granites of a prevailing red colour. Between these belts lie rugged tracts of essentially synclinal structure, occupied in ascending order by strata of red and gray gneiss and by some crystalline graphitic limestones, succeeded more or less irregularly by dark green amphibolic and pyroxenic rocks, with which the iron-ores are chiefly associated."

The Belmont Iron-Mine.

About 110 miles east of Toronto, 6 miles north of the branch of the Canadian Pacific Railway, between Toronto and Montreal, on Lot 19 in 1st Concession of the Township of Belmont, County of Peterboro, is found a large deposit of rich magnetic ore, closely resembling in mode of occurrence some of the Lake Superior mines. Experts estimate that this ore-bed contains at least 1,000,000 tons of ore within 100 feet of the surface, from which there should be no difficulty in producing 400 or 500 tons a day. ‡ The ore is very high in metallic iron, and by no means refractory in the blast-furnace. Samples taken from the pits possess a fine texture, and show but small traces of phosphorus and sulphur, with a high percentage of iron, constituting an almost ideal Bessemer ore.

The stripping is so light that the ore should be mined, by the use of compressed-air drills, at a cost of 50 cents

per ton, being so free from rock-matter that little culling will be required.* No trouble with water is to be anticipated, the ground possessing a natural drainage to the west, which can be improved and utilized at slight expense.

A special feature of this deposit is its proximity to the surface, necessitating but little expense for stripping, as mining can be done in pay rock almost from the commencement.† Some hematite is found on the east side in conjunction with soapstone.

Prof. Chapman says: "This is an exceedingly good ore, not too dense in texture, rich in metal, quite free from titanium and practically free from phosphorous and sulphur, and is well adapted for the Bessemer process."

The following analyses have been made, the first being from surface samples.

No.	Metal Iron.	Phosphorous.	Sulphur.	Silica.	Manganese.
1	64.26	Faint trace.	0.04	.....	.....
2	65.36	0.002	Trace.	4.5	.....
3	66.29	0.024	Trace.	3.19	0.42
4	68.88	0.006	Trace.	3.18	.....
5	68.85	0.008	Trace.	1.96	.....
6	69.99	0.012	Trace.	3.10	.....

No. 1 was made May, 1884, by Prof. E. J. Chapman; No. 2, July, 1886, by W. F. Brugman, chemist of the Scranton Steel Co.; No. 3, November, 1887, by the chemist of the Joliet Steel Co.; No. 4, same date, by Prof. Davenport Fisher, Milwaukee; Nos. 5 and 6, August, 1888, by the chemist of the Cambria Iron Co.

Much of the rock-matter surrounding this ore-deposit is composed of epidotic diorite.

The Blairton Iron-Mines.

Four miles south of the Belmont mine are the Blairton iron-mines, at the village of [that name, on Lot 8, in 1st Concession of Belmont, about 2 miles from the Canadian Pacific Railway.

At this place originally known as "the big ore-bred," there are large deposits of magnetic iron-ore, averaging probably 50 to 55 per cent. metallic iron, and low in phosphorous, with no titanium. Analyses have shown 0.035 phosphorus.

A considerable amount of ore has been taken out of these mines, as much as 300 or 400 tons daily having been produced here at one time. A large and deep excavation has been made, 150 feet wide by 250 feet long, and a second opening 160 feet deep lies south of the first.*

On the east side of the deposit is capped with Silurian limestone, while the west wall is a jaspery quartzite. The strike is west of north. In the wall, quartz and serpentine predominate. This ore is much mixed with rock, necessitating a good deal of culling, which renders mining expensive; and there has been sulphur in some parts of the deposit from the beginning.

This is one of the many iron-mines in Canada which cannot be worked at a profit for export under the United States duty of 75 cents per ton. If there were no duty this mine would doubtless be worked; it is capable of producing largely. At present the only use that can be made of such ore is to smelt it in a local charcoal furnace, there being plenty of hard-wood in the neighbourhood from which charcoal can be cheaply made, and limestone for flux not being far distant.

Central Ontario Railway Mines.

There are several large deposits of magnetic ore or close by the Central Ontario Railway in the north part of the County of Hastings. Some of these ores are of Bessemer quality (after roasting out the sulphur), but unfortunately the mines are now lying idle, owing to serious dissensions among the owners. The statement has been made that these ores are worthless, and that the mines are not worked on account of the sulphur in the ore; but this is surely not the true reason. Nearly 800,000 tons of magnetic iron-ore are annually taken out of the Cornwall hills in Pennsylvania and used as Bessemer ore, although containing an average of 2 per cent. sulphur and only about 48 per cent. metallic iron; and nearly 700,000 tons of other sulphurous ores, some of them being hard magnetites from the States of New York and New Jersey very similar to Central Ontario ores, are annually used in the United States. The sulphur entails an additional cost in roasting; but where other injurious elements are absent, a sulphurous ore, after being properly roasted, often can be used in the manufacture of Bessemer iron.

The roasting should be carefully done in Davis-Colby or other suitable roasters, where plenty of oxygen is sup-

plied during the process. The ore should be broken up fine enough and plenty of time given to make the roasting effectual.* This should be done where fuel is cheap, at a cost not exceeding 25 cents per ton. The cheapness of mining and freight would much more than counter-balance this expense on some Ontario ores.

Many of the Central Ontario ores could be conveniently shipped to furnaces in Pennsylvania by returning American coal-cars, which bring coal into Canada, but now usually return empty.

SNOWDEN IRON DISTRICT.

The townships of Snowden, Galway and Glamorgan in the County of Haliburton, about 40 miles northeast of Lindsay, contain several valuable deposits of iron-ore.

Lots 25, 26 and 27, in the 4th Concession, Snowden, on the south side of Burnt river, contain several outcrops of magnetite extending about three-quarters of a mile. This ore is on high ground overlooking the river and railway-track, and most conveniently situated for mining by drifts or tunnels run into the hillside, the mine-cars running by gravity to the shipping platforms or pockets at the railroad.

The following analyses show these ores to be very low in phosphorus:

No.	Metallic Iron.	Phosphorus.	Sulphur.	Silica.	Titanium
1	61.48	0.01	0.16	.....	None.
2	62.	Trace.	0.025	1.7	"
3	62.57	0.025	Trace.	.....	"
4	63.	Trace.	0.025	3.1	"

No. 1 was made by Prof. E. J. Chapman; Nos. 2, 3 and 4 by chemists of different iron-works in Pittsburgh, whose names are not in my possession.

Concerning analysis No. 1, Dr. Chapman says: "A fine-grained, magnetic ore from the Howland mine, Lot 26 in 4th Concession, Snowden. The ore near the surface is very pyritous, but becomes almost free from pyrites in descending. The sample was taken from a depth of 81 from the surface. A second shaft has been sunk on another part of the deposit to a depth of about 30 feet. The deposit is apparently an elongated stock-formed mass of large extent. It has been opened over a length of about 80 feet."

The railway passes through Lot 20 in 1st Concession, Snowden, on which are several outcrops of magnetite, one of them cross-cutting the Monck road, where it was first discovered. Prof. Chapman has analyzed a surface-sample and found it to contain metallic iron, 60.18; phosphorus, 0.08; sulphur, 0.04; titan acid, 0.73. He describes it as a black magnetic, fine grained ore, somewhat porous in texture. The deposit is apparently a stock-formed mass of large size, as shown by recent borings and excavations. Another analysis is given, showing metallic iron, 61.02; phosphorus, 0.052; and still others have shown metallic iron as high as 65% †

This district is about 200 miles from Buffalo, N. Y., to which point the ores could be delivered very cheaply in returning coal-cars. Moreover, these deposits are not much more than 100 miles from Midland, Ontario, whence ore could be shipped by boat to Chicago in returning grain-vessels. Limestone suitable for flux is found in close proximity to the ores, and there is abundance of hard-wood suitable for charcoal. There is also brown hematite in the neighborhood, yielding 45 to 48 per cent. metallic iron which would mix well with the magnetic ores in a charcoal-furnace.

The Paxton mine, in the adjoining township of Lutterworth, has produced several hundred tons of ore yielding 55 to 60 per cent. iron with no titanium and traces only of sulphur and phosphorus.

Ores from different parts of Galway Township, south of Snowden, have given the following analyses:

No.	Metallic Iron.	Mang. oxide.	Phosphorus.	Sulphur.	Titanium
1	62.37	Trace.	0.012	Slight trace.	None.
2	62.60	1.27	0.008	Slight trace.	"
3	65.	.....	0.04	0.02	"
4	70.40	.....	Trace.	Trace.	"

Nos. 1 and 2 were made by Prof. Chapman; Nos. 3 and 4 by Prof. Thos. Heys, formerly lecturer on chemistry in the Toronto School of Medicine.

VARIOUS ORE-DEPOSITS.

Professor Chapman has also made the following analyses of magnetites from this district which are free from titanium, viz.: Nos. 1,* from the Township of Glamorgan. A black crystalline, highly cleavable ore, carrying 70.38 metallic iron, with merely traces of phosphorus and sulphur. There are a few ore-exposures and needle-attractions showing a strong body of ore extending over a length of about 400 feet by 40 feet in width. No. 2 is an ore corresponding almost exactly in its cleavable structure and composition with No. 1, although it comes from another place several inches. Samples taken from a small trial-pit show 70.5 per cent. metallic iron with rock-matter under 3 per cent., but the ground is practically undeveloped.

No. 3. A black, fine granular ore from the vicinity of Apsley village, in the northern part of the township of Burleigh. Metallic iron, 63.68 per cent.; phosphorus, a trace only; and sulphur, 0.03. The intermixed rock-matter is essentially pyroxenic. Ground undeveloped.

No. 4. A very rich magnetic ore from the township of Madoc, the dried ore yielding 69.16 metallic iron; phosphorus, 0.04; and sulphur 0.03, with siliceous rock-matter, 3.32.

No. 5. A magnetic ore mixed with specks of actinolite from Madoc township. The sample contained nearly one per cent. pyrites and yielded iron, 60.32; phosphorus a trace; and sulphur, 0.52. Another sample from the same property gave iron, 62.54; phosphorus, 0.03. and sulphur, 0.38.

KINGSTON AND PEMBROKE DISTRICT.

The following analyses have been made of magnetic ores from the country tributary to the Kingston and Pembroke railway.

No.	Metallic Iron.	Phosphorus	Sulphur.	Silica.	Titanium
1	65.33	0.017	.....	.....	None.
2	66.	Trace.	Trace.	2.14	"
3	62.	0.006	Trace.	4.12	"
4	60.	0.009	.....	6.31	"
5	52.	0.055	0.10	6.53	"
6	65.07	0.07	0.05	6.66	"
7	66.34	0.14	Trace.	1.04	Trace.

No. 1 was made June, 1883, by Ledoux and Ricketts; Nos. 2, 3, 4 and 5 by a chemist employed by the Kingston and Pembroke Iron and Mining Co.; No. 6, November, 1871, by J. Blodgett Britton; No. 7 by a chemist unknown to me. This analysis, with Nos. 2, 3, 4 and 5, was published by the Minister of Agriculture in connection with the mineral exhibit of Ontario at the Cincinnati Exhibition of 1888.

TITANIFEROUS ORES.

In Minden, the township lying north of Snowden, there are large quantities of magnetic ores containing a considerable amount of titanium. A black, granular, strongly magnetic ore from near Lake Kushog showed by Dr. Chapman's analysis the following results: Metallic iron, 51.56; Titanium, 15.64; Sulphur, 0.17; Phosphoric acid, trace; Siliceous rock-matter, 4.08.

Similar ore is found on several adjoining lots, and there appears to be a good deal of titaniferous ore in this and neighboring townships.

There is an enormous deposit of black, strongly magnetic ore in the township of Glamorgan, about half a mile south of Burnt River. The deposit rises abruptly in the form of a succession of ledges to a height of from 80 to 100 feet above the general level of the ground, and is exposed in an easterly and westerly direction for at least 1,800 feet, with an average width of 140 feet. The analyzed sample contained 52.04 metallic iron; 8.11 titanium; 0.005 phosphorus; and 0.005 phosphorus; and 0.06 sulphur.

Another deposit of similar ore has been found some distance from the one just described. This ore carries from 8 to 10 per cent. titanic acid, which appears to be persistent throughout the whole ore-bed, the yielding of metallic ore being nearly 60 per cent.; phosphorus 0.007; and sulphur 0.08.

It may be remarked that titaniferous ores in these districts are generally very low in phosphorus, and if some treatment could be found whereby the injurious effects of the titanium could be got rid of they might be used in making steel.

Dr. Chapman remarks that "the presence of these titaniferous ores in close proximity to deposits in which no trace of titanium can be detected, is a fact of much interest hitherto apparently unrecognized in the iron-districts of Europe."

The writer feels warranted in protesting against the habit, which has prevailed in some quarters, of characterizing all Canadian ores as titaniferous. Nothing could be more unfair. Canada is a country of great extent, and it is just as absurd to class all Canadian ores as titaniferous because those objectionable ores are found in some places, as it would be to condemn Lake Superior ores because titanium is found in some parts of northern Minnesota.

Ontario contains, as I have shown, many ores perfectly free from titanium, although there are certain ranges or belts of territory in which titanium prevails to a considerable degree.

Many of the magnetite deposits in eastern Ontario are rich in iron, and carry, too, very low percentages of phosphorus and sulphur with no titanium at all. Others are high in sulphur but still free from other impurities, so that they require roasting only, in order to make them available as exceedingly pure 60 per cent. ores. Finally, the rates of wages in these districts generally range from \$1 per day for laborers to \$1.25 for miners; and, as has been observed, the commercial conditions of transportation are exceedingly favorable. Nothing seems to be lacking but access to the market of the United States.

* Paper read before the American Institute of Mining Engineers. † Mineral Resources of Ontario, pages 17 to 22. ‡ Prof. Heys, Report, 1885, and Prof. C. Gordon Richardson, Report, 1890.

* Report of F. D. Taylor, M.E., 1886. † Prof. C. Gordon Richardson, Report, 1890. ‡ Report of the Royal Commission on the "Mineral Resources of Ontario," 1890, p. 127.

* See Dr. Valentine's paper of October, 1880, *Trans.*, xviii. † These five analyses are numbered in Professor Chapman's list 9 to 13 inclusive.

† All the analyses of titaniferous ores here given were made by Prof. Chapman.

Phosphate Shipments.

The following have been the shipments of phosphate from the Port of Montreal, as per Custom House manifests, since our last advice, to date:—

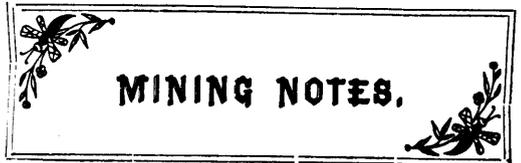
Date.	Name of Ship.	Destination.	Shippers.	Quantity.
Sept. 27	SS Kehrweider	H'mburg	Wilson & Green...	150
" 27	do	do	Lomer, Rohr & Co.	85
" 20	Gerona	London	do	152
" 30	Barque Medbor	Q'nstown	do	84
Oct. 3	SS Erl King	London	do	220
" 6	Borghesa	Glasgow	do	185
" 8	Dominion	Liverpool	do	330
" 9	Cremon	H'mburg	do	200
" 13	Barque Skudesnaes	Grimby	Wilson & Green...	75
" 13	SS Ripon City	Hull	Millar & Co.	200
" 13	do	do	Lomer, Rohr & Co.	120
" 20	Oxenholme	Liverpool	Wilson & Green...	570
				To Europe..... 2371 tons

SHIPPER'S RECAPITULATION.

	Tons.	Bags.
Lomer, Rohr & Co., (to 19th June) ..	2,715	100
do (to 23rd July) ..	1,830	100
do (to 23rd Aug.) ..	1,845	..
do (to 20th Sept.) ..	1,350	20
do (to 13th Oct.) ..	1,376	..
<hr/>		
Millar & Co. (to 18th June) ..	1,475	..
do (to 15th July) ..	1,540	..
do (to 23rd Aug.) ..	300	..
do (to 6th Sept.) ..	1,140	..
do (to 13th Oct.) ..	200	..
<hr/>		
Wilson & Green, (to 16th June) ..	823	..
do (to 22nd July) ..	2,132	..
do (to 23rd Aug.) ..	559	..
do (to 20th Sept.) ..	725	..
do (to 20th Oct.) ..	795	..
<hr/>		
	5,034	..
<hr/>		
	18,805	220

RECAPITULATION OF EXPORTS.

	Tons.	Bags.
Liverpool—Previously reported ..	8,720	100
do Reported to 25th Sept.	900	..
<hr/>		
Reported to date.....		
London—Previously reported ..	3,540	..
do Reported to 20th Sept.	372	..
<hr/>		
Reported to date.....		
Hamburg—Previously reported ..	1,914	..
do Reported to 20th Sept.	435	..
<hr/>		
Reported to date.....		
Glasgow—Previously reported ..	1,355	120
do Reported to 20th Sept.	185	..
<hr/>		
Reported to date.....		
Swansea—Reported to date.....	500	130
Hull—Previously reported ..	320	..
do Reported to 20th Sept.	320	..
<hr/>		
Reported to date.....	200	820
Newcastle—Reported to date.....	75	200
Grimby, reported to date.....	75	75
Queenstown, " ..	84	48
U. K. Ports, " ..	75	75
<hr/>		
Total exports to Europe since opening of navigation to 20th Oct., 1890 ..	18,805	220



MINING NOTES.

Nova Scotia.

(From Our Own Correspondent.)

Pictou County.

Mr. T. Turnbull, manager, and Mr. W. B. Moore, of the Vale Colliery, have resigned.

The engine-house at the East River mine, operated by Messrs. John Muir & Sons of New Glasgow, was destroyed by fire last month. The loss is estimated at between \$600 and \$700, not covered by insurance. The building has been rebuilt and equipped with a new boiler.

A party of 27 miners left Stellarton this month for work at the mines of the Alberta Railway and Coal Company at Lethbridge, Alta, N.W.T. Another party will leave shortly.

The Steel Company of Canada declared a dividend of ten per cent. at its last annual general meeting.

Cumberland County.

The Londonderry Iron Company is getting ready to put its second furnace in blast.

The English syndicate which recently acquired the Joggins mine in Cumberland County is reported to be in treaty for the railway connecting the mine with the Intercolonial Railway at Macan. The line, which is about eight miles long, runs parallel with the outcrops of the seams of the north edge of the basin, and will prove of value, as it connects with shipping facilities at the Joggins and River Hebert. The figure named is said to be \$180,000.

Mr. James Baird, formerly manager of the Chignecto colliery, is now in charge of the Joggins colliery, and is introducing the system of working from bond and pillar to long-wall. The miners are favorably disposed to the change, which they think will better their condition. Quite a number of men from the other mines are seeking employment under Mr. Baird's popular management.

The airways at the Springfield colliery have been enlarged, greatly improving ventilation. The shipments for September were fully 40,000 tons, and an increase in the returns for October is anticipated.

Cape Breton.

At the Caledonia mines there are ninety-five pairs of cutters employed, a larger force, probably, than ever before were employed. The output from the mine is close upon 600 tons per day.

In consideration of the early starts made by the miners, in order to give quick despatch to steamers, Mr. David McKeen, M.P., the popular managing director, has granted a bonus of one hundred dollars to Equity Lodge. This affords sufficient proof, says the Stellarton *Journal*, that our manager recognizes the Lodge as the proper party with which to do business. And Mr. McKeen is right; better to do business with a responsible committee than with a lot of irresponsible bodies.

At the Bridgeport collieries work continues steady, and is expected to continue so for some time yet.

At Sydney mines the output is estimated to be quite 700 tons per day. 118 pairs of cutters are employed.

Gold Mining Supplies.

The principal depot in Nova Scotia, carrying the most complete assortment of first class goods, is

H. H. FULLER & CO'S
41 to 45 Upper Water St., Halifax, N.S.

Our line comprises Explosives, Fuse, American and English Mill and Hammer Steel, Bar and Bolt Iron, Steel Wire Hoisting Rope, Hemp and Manilla Rope, Rubber and Leather Belting, Miners' Candles, Oils and Lamps, Miners' Tools, Machinists' Tools, Blacksmiths' Tools, and every requisite for the gold miner.

H. H. FULLER & CO.,
Halifax, N.S.

COXHEATH COPPER MINES.—Developments continue to be satisfactory to the management. The 260-foot cross-cut north from No. 2 shaft has cut vein "B" at 87 to 103 feet from the shaft, showing the width of the vein at this level to be 16 feet; it contains eight feet of good ore next to the hanging wall, the remainder being partly of lower grade, with streaks of rich ore. One of these streaks lying on the foot wall is 15 inches wide. The average of the vein is fully as high as at the 184-foot foot level, where it was estimated to be 10 per cent. copper. The hanging wall is dipping to the north and the foot wall to the south, indicating a further increase in width with depth. Shaft No. 1 is unwatered down to the 60-foot level. From this depth the old cross-cut south into the mountain is already in 70 feet, and will be at once continued to intercept known veins discovered since work at this shaft was suspended. At the new vein on the mountain the shaft is down 25 feet, the bottom being all in ore; this shaft will hereafter be known as No. 3 shaft. Tunnel between No. 1 and No. 2 shafts is in 130 feet. An additional force of 15 workmen are now cross-cutting the surface opposite the lake, 2,000 feet west of No. 2 shaft. Eight Rand power drills are now constantly at work on the property, and the other two will be started at an early day. Since the reports on the mine, rendered last July, over 6,000 tons of additional ore have been put in sight on vein "B" alone.

Caribou District.

The Halifax Mining and Prospecting Company have acquired the property adjoining the colliery to the Westward, formerly worked by Daniel Tonquoy, and are erecting light pumping and hoisting gear upon the same. The property is a wet one, and considerable water will have to be handled. Mr. Edward Whidden will have charge of the work.

Central Rawdon.

Work in the mines of the Northup Mining Company, Ltd., was suspended about the middle of September, but about the 10th of this month was partially resumed. The company are sinking two shafts by contract, and it is understood that other work will be suspended pending developments made by these shafts.

The yield of the Central Rawdon Company has also largely fallen off, and no large returns have been made for some time.

Whiteburn District.

The mills of the Rossignol and Queen's companies are rapidly approaching completion, and will probably be stamping quartz ere this is in print. Both are under the management of Mr. Julius Puttner, late of Malaga District.

Malaga District.

Matters seem to be very quiet here at present. The Parker-Douglas Company are working steadily, and report most excellent results from the Golden Gate concentrator which has been lately added to their mill.

From the Malaga Mining Company there is no news. Since Mr. McGuire resigned the superintendency Mr. Alfred Wade has been acting in that capacity. It is understood that the working force has been confined to the Rabbit Lodes.

Waverley District.

The Nova Scotia Syndicate, at the Windsor Junction mine, has ceased all work except that of widening and straightening the pump-shaft at the eastern end of the Union lode. It is proposed to make this the permanent hoisting-shaft for the present, and a skip-track will be put in as rapidly as possible. Manager MacDuff is putting in a new hoisting engine at this shaft, manufactured by W. W. Howell & Co., of Halifax.

The mill of the Lake View Company started up the last week of September, and has been running, with occasional stops for adjustments, ever since. The mill contains twenty stamps and eight fine vanners, and the manager, Mr. A. A. Hayward, claims to be losing less than 20 cents per ton in his tailings.

It is reported that a sale of the Gue and Wilson property has been made, but no facts are made public as yet.

In General.

"The fact that Nova Scotia coal is far inferior to Pennsylvania bituminous is no reason why the tariff should be removed on Canadian coal," said Harry A. Berwind, of the Berwind-White Coal Mining Company, recently, in speaking of Senator Sherman's reciprocity scheme. "The cheapness of the Canadian coal would make many people prefer it to the Pennsylvania coal without regard to the comparative value of the two, and for that reason the removal of the tariff would have some effect on the New England coal trade. Still, we don't fear the Canadian competition in the long run."—*Philadelphia Inquirer*.

The above paragraph is a very fair sample of the slip-

shod and wilful misrepresentations that are occasionally prominent in the columns of our contemporaries across the line. A gentleman very prominently identified with the coal interests of the Province, on being shown the paragraph, remarked: "There are good and bad coals in both countries, some coals better suited to one purpose, and some for others, but the writer of the paragraph in question evidently is indifferent to facts; he don't want to be set right, being content to make a political point regardless of truth."

Prof. Bailey, who has been conducting investigations during the summer in Shelburne and Queen's counties for the Geological Survey of Canada, reports the area of auriferous strata in these districts much larger than was generally believed, and predicts that important new discoveries will soon be reported from that quarter.

New Brunswick.

The Windsor Gold Mining Company, Limited, has made application for incorporation under the Joint Stock Companies Letters Patent Act, Capital \$100,000. Head Office: St. John, N.B. Directors: J. H. Harding, St. John, N.B.; W. W. Clark, St. John, N.B.; H. T. Harding, Truro; W. R. Stockbridge, Boston, Mass.; Gideon Havenor, St. John, N.B.; H. E. Hardige, Boston, Mass.

Quebec.

Eastern Townships District.

(From our own Correspondent.)

The American Asbestos Co. have placed a cable derrick in position on the hill above the main workings. This is the first derrick of this style that has been tried in the asbestos mines. By means of this derrick they are enabled to hoist the waste rock from the pits and haul it away from their openings without handling it by hand. It is a decided improvement on the boom derricks and could be used to advantage by other companies, especially those who have large pits, where it is impossible to place boom derricks to reach around to all parts. By stretching the cable across the pits loads can be lifted from any point. Their manager, L. A. Klein, has returned from an extended trip through the States.

Dr. James Reed has his plant nearly ready to run. It is expected that it will be running about October 25th. The doctor is also erecting some dwelling houses on his property for the workmen employed. Several pits are opened and are being worked with good results.

Work at the pits of the United Asbestos Co. is being carried on with good results. They have commenced taking off top rock in their large pit with a view to widening it. The bottom of this pit has been and still is very rich, but before taking any more from the bottom it was necessary to lighten the top. Several veins large, but discolored, have been struck on the top and give every indication of continuing at depth.

Work at the Anglo Canadian is going on as usual. They have taken down their large boarding house and are building smaller houses for their workmen.

Messrs. King Bros. are driving a tunnel under the railroad to reach good ground on the other side. The openings are all looking well.

The Laurier Co. are working on their lots, but we do not hear with what success.

Messrs. Walsh & Mulvena, of Sherbrooke, have done some exploring on a lot at East Broughton, near the property of the Scottish Canadian Asbestos Co. Numerous veins have been shown and it has every indication of being a good thing. Some very fine samples have also been taken from a property near Tring Station.

Capt. T. R. Davey, Harvey Hill Mines, leaves shortly for England on business.

Work at the Megantic Mines, Coleraine, has been suspended.

It was intended that the visiting members of the British Iron and Steel Institute and the German Association of Iron Smelters should have paid a visit to the Asbestos Mines in this district, the copper, smelting, chemical and fertilizing works at Capleton, the marble quarries at Marbleton and other points in the Eastern Townships, but it was found to be impossible to make any suitable arrangements that would permit the party to return to New York from Sherbrooke and it was accordingly reluctantly abandoned. The Messrs. Nichols too have no inclination to make a precedent of opening their works to visitors and refused permission to admit the visitors to their interesting and extensive works.

All the Thetford mines are working full time and making out out-puts satisfactory to their owners.

Ottawa Valley.

Having completed all necessary arrangement Mr. Geo. Stewart has commenced operations at the newly acquired properties of the Phosphate Corporation, Limited. Mr. Stewart will exercise a general supervision of the mining work at the High Falls, Ross mountain and Murphy properties at each of which a force of 50 men will be at once employed. Mr. Stewart starts work on a guarantee to produce 10,000 tons of phosphate from the Ross mountain and High Falls properties, and there is no reason why his moderate anticipations should not be fully realized, both properties being most promising. The formal transfer of the properties to the corporation took place on Wednesday, 22nd, with befitting ceremonies. Mr. William Macintosh, Buckingham, will manage the Ross mountain under Mr. Stewart's direction.

Mr. O. M. Harris intimates that his exports to all points for this season will more than double his production last year. Large quantities of high test phosphate are daily being raised and shipped from the Canadian Company's pits.

It is thought that the export from the High Rock mines for this season will figure close upon 5,500 tons. About 2,000 tons of 60% ore have been exported with the higher test shipments.

Ontario.

The Standard Asbestos Company of Ontario, Limited, is the name of a new company incorporated to operate asbestos lands in the township of Elizier, County of Hastings. Authorized capital \$100,000, divided into 100 shares of value of \$100 each. Directors, Hon. J. E. Campbell, Hamilton, Ohio; D. U. Jennings, New York; F. J. Falding, Sherbrooke; R. H. Martin, New York. Head office, D. U. Jennings, secretary, 45 Broadway, New York.

Port Arthur District.

(From Our Own Correspondent.)

THE BADGER SILVER MINING COMPANY.—Your correspondent has recently visited this company's property, and through the courtesy of Superintendent Shear was shown through the various workings. The prediction made in these columns some time ago has been amply verified. The shipments have exceeded the estimate, as they are now making semi-monthly shipments of smelting ore and concentrates; each shipment consists of one carload, containing 17 tons. The "West End" vein has developed into a strong, well-defined lode having an average width of 3½ feet between the walls. The gangue is composed of calcite, zinc blende, galena, pyrites and black silver, having an average value of 150 ounces of silver to the ton of 2,000 pounds, the richest portion being along the bottom of the level, which appears to be driven over the top of a rich ore body. The breast of the level is now within a short distance of the intersection of No. 1 vein, at which point a shaft will be sunk and drifting commenced. It is also the intention to begin driving No. 1 level on No. 1 vein. When work ceased at this point last year the vein was five feet wide in the breast and carried 40 ounces of silver to the ton. At No. 2 vein, No. 1 level west from the shaft is being pushed on as fast as possible. The pay streak is 18 inches wide, the ore of which averages 1800 ounces to the ton. A winze is being sunk 175 feet east from No. 2 shaft. The vein in the winze is carrying its width down and is producing 100 ounce ore. No. 1 adit level, on No. 3 vein, is now in a total distance of 240 feet, and is in bonanza ground. The vein has a uniform width of 3 feet. The gangue is the same as at the "West End" and No. 2 veins. The ore from it is averaging from 1425 to 2140 ounces to the ton. No. 1 shaft on No. 4 vein is down 135 feet, and has been in bonanza ores for the last 65 feet. The ore on some portions of this ore body averages as high as 7,000 ounces to the ton.

SILVER ISLET CONSOLIDATED MINING AND LANDS COMPANY.—H. S. Sibley and Professor W. M. Curtice of Detroit, paid a visit this week to the Edward's Island location for the purpose of making an examination of the development work done. Their examination proved highly satisfactory; they left for home on the 14th inst. taking large samples of Arsenical silver with them. The vein is a true "fissure" averaging 3½ to 4 feet in width; it crosses a series of horn blende, porphyretic and trap dykes, every one of which it faults; it has been traced across the island, and shows up in a strong out cropping on the north point. The gangue of the vein in the shaft is composed chiefly of calcite, with some quartz and boryta, heavily mineralized with glena, blende, iron and copper pyrites and nickel; at a depth of 20 feet a seam of arsenical silver and nickel came in, and is continuing down as depth is attained. Selected samples assayed from 40 to 130 ounces of silver to the ton. A steam hoisting and pumping plant will be placed in position as

soon as the necessary buildings can be erected, Capt. Trethewey is at present engaged in opening up the company's copper property at Cape Maimaise.

THE BEAVER MINING AND MILLING COMPANY.—Extensive improvements have been made recently to the mill, four new vanners have been placed in position, three of which are the invention of the superintendent, and are doing excellent service in saving the fine silver from the slimers. The last shipment was made on the 27th ultimo. It consisted of 17 tons of concentrates and smelting ore, valued at \$25,000. They have at the present writing 37 tons of concentrates on hand at the mill and at the C. P. R. warehouse at Murilla station.

Mr. Richard R. Paulison returned this week from a two months trip along the Bessemer Iron Range, contiguous to the Port Arthur, Duluth & Western Railway, now under active construction to the Minnesota boundary, 84 miles from Port Arthur, 40 miles of the road already having been completed this season.

Mr. Paulison also examined the vertical deposits on Hunter's Island. The most favorably known deposit of merchantable ore lies one and a half miles across the boundary in Minnesota, and consists of 160 acres of land belonging to the Milwaukee Iron Company. Commencing at the breakoff to the north, the ore lies nearly horizontal with a dip of only 5 degrees. A trench about two feet deep has been dug along the iron about 500 feet, and pits sunk passing through seven feet of ore, the top two feet of which certainly will average 67% of metallic iron, and the entire horizontal deposit produce large quantities of good shipping ore.

Two miles west from this property the Chicago Iron Company own a valuable location, and which they favourably tested last winter with a diamond drill. This range has been traced from these deposits in a north-easterly direction to the Canadian Pacific Railroad at Kaminstiquia, a distance of nearly 80 miles, and on its course are located the Caldwell, Segwick and Paulison properties. The ore is distinctly different in appearance from that of the Vermillion and Hunter's Island ranges, and comes within the class of steel producing ores, and is black in colour, while the ranges immediately north carry the red and grey hematites. The entire range juts against the gneiss or so called granite overflow, and has a horizontal tendency. At the Caldwell and Segwick tracts, north of Gunflint Lake, several test pits have been put down, and prove conclusively the presence of ore in large quantities. This also applies to the thirty odd miles of deposits belonging to Mr. Paulison, north of North Aarow and Whitefish Lakes, where the most prominent exposures of ore in place are found on 77 A., 88 A., 38 A., and numerous locations north of Round Lake. The "Wigwams" R. 257-258, in which the Sibley's, of Detroit, are interested with Mr. Paulison, have the largest body of ore in sight of any location on the range, and the essays average over 60%. Peewabic Mountain, still further to the north-east, has a good showing on its north and south face, but has not yet been thoroughly explored.

British Columbia.

At Illecillewaet the Selkirk Mining Company is running a 500-foot tunnel on the Lanark, the work being done by contract. This tunnel is expected to tap the ledge at a depth that will solve the problem.

The miners at the Union collieries, Comox, are very busy turning out good quantities of coal. The company's wharf is most favorably situated, and can accommodate as many as seven vessels at one time. The pits are turning out from 300 to 400 tons per diem.

The following are the official returns of the value of the exports of minerals from the ports of Victoria, Vancouver and Nanaimo for the three months ended 30th September:—

Minerals.	Victoria.	Vancouver.	Nanaimo.
	\$ cts.	\$ cts.	\$
Coal		18,511 00	389,116
Lime	1,061 85	1,517 50	
Stone		255 67	1,120

Returns of the value of coal exported from Nanaimo shows the following:—September, 1889, \$397,497.55; December, 1889, \$439,448.37; March, 1890, \$385,528.17; June, 1890, \$414,827; September, 1890, \$389,116.

A trial shipment of 100 tons of coal from the mines of the Canada North-West Coal Company at Canmore has been sent down by S. S. Walla to San Francisco to be tested. The H.M.S. Espeigle also Saturday, before she left the harbour, took on 25 tons, and will make a test on the coal. The result of the experiment will be sent to the Admiralty for their consideration.

McKinnon has a few men at work on the Maple Leaf, a claim adjoining the Lanark, and has five horses packing ore to the railway, for shipment to the Revelstoke smelter.

In the Hot Springs district the main subject of discussion is the success or failure of the Best patent smelter. The patentee is on the ground clearing a site for a plant of 20 tons capacity. The location selected is at the mouth of Woodbury Creek, two miles north of Ainsworth.

The pump and hoist for the Little Donald was brought in from Bute this week, and contractor Northey is now engaged in getting it up to the ground and in place.

The machinery for the Krao was ordered from Chicago some time ago; but the manufacturers made a mistake in shipping it, and a "tracer" found it down on a Southern Pacific sidetrack in Arizona. It is expected in next week.

In the Mountain District the only thing worthy of note is the ore shipments from the Silver King. Six days a week Joe Wilson's train of pack animals makes a round trip between the steamboat landing and the mine. The estimated value of the ore brought down daily is from \$1,000 to \$1,200, each sack of 100 pounds being worth \$15. The Surprise and barge transports the ore from Nelson to Bonner's Ferry making two trips a week.

At Eagle Creek, the Poorman Company is at work making preparations to start a tunnel that will tap the ledge at a depth of 300 feet. A Pelton wheel is being placed in position, and a Burleigh drill has been ordered. This company means business, and everything undertaken is carried out successfully. The Royal Canadian has been examined by a number of "experts," and a deal is now said to be in progress, which, if made, will place that property in the hands of men backed up by Ontario capitalists who are not afraid to invest a few thousands in gold prospects.

Gold Mining in Australia.

Theodore West, Darlington, Eng., read before Cleveland Institute of Engineers.

The first part of this paper is descriptive of the colonies of New South Wales, Victoria, South Australia, Queensland, and West Australia, particularly with regard to their mineralogical characteristics. These colonies, the author states, are highly advanced, socially and politically, attributable mainly to the discovery of gold and other valuable minerals, as well as to the many other resources within them—the development of which affords employment for many of our surplus population.

He states that soon after the discovery of gold, nearly all the most productive spots were pitched on, specially where the metal was easily worked, and exhausted by the simplest of contrivances in the hands of men who knew little or nothing of mining or minerals.

The following is a section of the deposit in which the gold is usually found:—

On the surface is a thin layer of top soil, thin strong ferruginous sand, fine gravel, then alternating layers of sand and gravel, coarser and coarser the deeper one goes, then large pebbles, and, lastly, boulders resting on the rock. It is in the latter stratum that the largest finds were obtained, or in the chinks and holds of the bed rock. Sometimes the gravel and pebbles were naturally bedded together with clay which, on exposure to the weather, readily fell into pieces, whilst at other points it was found to be bedded hard with what was called cement, probably due to the lime, iron, or silica contained in it.

In estimating as to the probabilities of ground paying for gold working, the yield of gold per ton of material handled is only one of the elements which have to be taken into account, as it will greatly depend on whether the material is hard or soft, near the surface or requiring to be raised from a depth, wash-dirt scarce or plentiful, and a good supply of water obtainable near the site of the operations.

The process of washing the alluvial gold is next gone into and depends on the well-known theory that the heavier substances always sink to the bottom, consequently all the apparatus used in this operation is designed and constructed on the principle that, while water has the power to wash away the base material, the metal is almost entirely left behind. The processes

described and illustrated are:—(1.) By means of the "hand cradle," which is very tedious and laborious; (2) The "Tom," which better enabled poorer ground to be worked to pay than what could be done by the cradle; (3) By "sluice boxes;" (4) The "puddling machine," for clay wash-dirt; and (5) By "hydraulic sluicing," an American process, which is objectionable on account of the large amount of debris that was washed into the streams and water-course, and deposited on the low lying lands. It is stated that, as the alluvial deposits operated on were exhausted, and owing to the finding of small pieces of quartz with gold adhering to them, the attention of miners was directed to the quartz veins which were found traversing the various districts, some of them for miles. They are usually found to dip at an angle of 40°, although at times a flat-lying reef, several feet in thickness, is found extending over a considerable area, but generally poor in metal.

The veins are found to vary in colour from pure white to black; the clear white are usually barren.

In the mining of the veins, a depth of about 330 fathoms has been reached, necessitating the employment of experienced miners and the use of costly machinery and other plant for the purpose of raising the ore to the surface, and skilful application of refined chemical process, to be used for wholly extracting the gold from it.

The author gives a sketch of a ten-stamp battery used for crushing the ore, also of "Chilian Wheels," and many of the other machines in use many years ago, as well as descriptions of the various mechanical and chemical processes now in use—such as the Cassell's patent, acting on the principle of decomposition of common salt and crushed ore by galvanic action, dissolving the gold, which is filtered through asbestos cloth and precipitated; and also the MacArthur-Forest Amalgamator, by which the ore, after being firmly ground, is mixed with the cyanide of potassium stirred for 8 or 10 hours by a four-bladed propeller, then filtered through fine zinc, and deposited as a cyanide of gold.

How to Manage Steam-Engines.*

It is rather a difficult matter to write about the management and repairing of engines, as nearly all the repairs are what should be a machinist's job, as nearly all would require machine work to properly complete it, therefore it cannot be classed as a part of an engineer's business.

As regards the management of steam engines, it will be necessary to begin at the foundation, and give a minute description of the manner of setting up and adjusting work, which every engineer should understand in order that he may know what his engine needs when not doing its work properly. Every foundation for an engine requires the skill of a stone or brick mason to build, and when that is properly done then the engineer's duties begin, the first thing being to place the frame or engine bed upon the foundation, seeing that it is banded up and firmly held in its proper position. The next thing in order is to place the shaft in its bearings, seeing that it is on a proper level, and fits its bearings properly, to run easy and smooth. Then place the fly-wheel in position upon the shaft, taking care that it runs true (as it should be properly fitted when made), placing it equal distance between the shaft bearings, so that the weight will be alike on each. Next in order is the placing of the cylinder on the bed in its proper position; there should be no mistake about this, as there should be what are termed steady pins to hold it in its place.

To prove that the shaft and cylinder are properly placed, attach to the outer end of the cylinder a small piece of board, long enough to reach across its end and fastened with one of the bolts which holds the head on. Attach to this piece a fine strong cord or wire that will not break on being drawn tight, fasten on the farther end of the bed another piece of board, leaving enough to stand up as high as the center of cylinder, attach the other end of the cord to the latter piece, bringing it exactly to the center of cylinder, which can be done by calipers. Turn the fly-wheel over, bring the wrist pin to the line, and be particular that it is exactly in the center of the bearing on the pin; then reverse the fly-wheel, bring it to the line of the other center. If the line is on the center of cylinder, also on center of wrist-pin when turned on both centers, then your engine is on line; but if not then the cylinder must be out of line, or else the shaft is not square with the cylinder, in which case it must be brought to a perfect line, either by moving the cylinder, or pillow block the outer end of shaft. When these points are in a perfect line, put in the piston and attach the connecting rod to the cross head, being sure that the cross-head comes in a perfect line with the center of cylinder.

When this is accomplished, all is ready for connecting the smaller parts, such as cut-off, rod-valve, &c. This brings us to an important part of the work, viz., the setting of the valve, of whatever kind it may be. I find this the most simple way to adjust in a slide-valve engine. Turn the fly-wheel to its furthest point, or in other words, to its center point, which will bring the piston

head to one end of cylinder; now set the valve so as to cover the port, leaving not more than 1-4th of an inch from the introduction of steam, when the crank is on its center, and see that the valve stands in the same position; if not, it may be adjusted by the length of connecting cut-off rod, until the valve stands in the same position at each central point. When this is done see that the exhaust port is clear, to relieve the cylinder of the steam at the proper time. I have seen engines set up with the valve of a length not to admit of a free exhaust, which caused the engine to work heavy.

Another important point in the arrangement of an engine is the steam feed and exhaust pipes. The rule generally adopted is, to have the exhaust pipe 1/2 inch larger than the feed pipe, but I find by experience that the exhaust should be 1 inch larger, which will cause the machine to run much freer, causing less strain than when a smaller pipe is used.

Another important point is the setting of the piston packing rings; these should be set very carefully, taking great care that the piston head is exactly in the center of the cylinder, using a pair of calipers in adjusting it.

As regards care and management of an engine, after being put in order according to the above named points, but little work is required, but it must be constantly watched and kept well lubricated in all its parts, the cylinder receiving special care. It should have a lubricator attached to the feed pipe just before it enters the cylinder, emitting two or three drops per minute, according to the load the machine is carrying, and great care must be taken with the packing rings to keep them just tight enough to prevent any leakage of steam, and not tight enough to cause any great friction.

I have found that one good qualification in an engineer is to know enough to let his machine alone when it is working well, and to know when it is doing well. I have known men in charge of machines to be constantly at work at them, and often getting them out of order instead of benefiting them.

Great care should be taken to keep all of the bearings just tight enough to run easy without any slack motion, which causes them to thump or pound at each revolution.

In setting up the keys I find it best to use a soft metal hammer, which will not bruise the end of the key. In using, hit it one blow on the point, which will give it a little back motion, just to give the bearings a free working motion.

It is the custom of many engineers to oil the cylinder three or four times per day with about one gill of oil, but this is not the proper way. A cylinder needs oil the same as any other bearing, in very small quantities and often.

Another important matter is in starting the machine. All drips should be opened and the water drained out, by letting a little steam in to warm up the cylinder before it is started, and then slow for one minute, giving it time to work off all water which has settled in it, getting it well warmed up before running at full speed.

The great point in management is to keep close watch and to know when the machine is not running right; then, if wrong, learn just what the trouble is before any changes are made, as the machine may be injured by not doing the right thing. An engineer should be a good machinist as well as a careful man, possessing good judgement, never doing repairs or making changes until he knows what is necessary to be done. If the above rules are strictly observed, very little repairs will be needed, except in case of breaks, and as to directions about repairs, no mechanic can tell just what to do until he sees just what the break is and determines its cause. Any other plan for repairs would be much like "ideal farming;" practical knowledge is the best.

*Prize article by B. Taylor, in the *Sawmill Gazette*.

Underground Pumping.

The mode of dealing with the large quantity of water often met with in sinking pits has always been a matter of great importance, because of the following obstacles which have to be overcome: First, having constantly to lower the pumps, together with a consequent lengthening of the spears or rods; second, the difficulty of keeping the valves and working barrels in order, in consequence of the quantity of solid matter which is necessarily raised with the water; and third, the difficulty of carrying on sinking work with pumping plant always at the bottom of the pit. A special form of sinking pump, recently designed by Messrs. Bailey & Co., of Salford, is now successfully at work at the Cadeby mine in South Yorkshire, and contends with the above difficulties in a very satisfactory manner. The pumps are hung in the shaft by wire cables from the surface and are easily lowered by means of powerful capstans as the sinking progresses. The special feature of this steam pump is that, instead of having an engine with foundations, connecting rod, quadrant and spears, all liable to wear and tear and mishap, the combined engine and pump is the only thing to be dealt with. Eye-bolts are provided at the top, by which it is suspended from chains or wire ropes, and

lowered to follow the falling water. The pump consists of three hollow plungers. The upper pair are stationary, and over them are sliding barrels which are connected to the steam piston. From the lower end of these barrels projects the bottom plunger, working into the third barrel, which is secured by means of connecting rods to the steam cylinder. Thus there are two smaller barrels in connection with the larger ram.

There is a group of valves in the junction between the smaller barrels and the larger ram, constituting the delivery valves; and another group of valves at the bottom of the large barrels, constituting the suction valves. The action of the pump is as follows: As the bottom plunger rises, the water follows it into the lower barrel; at the same time the water in the upper hollow plungers is forced into the rising main. In the down stroke, the water in the lower barrel is forced through the lower plunger and valves into the upper barrels and plungers, and thence into the rising main. Thus there is a continuous delivery in the up and down strokes. One of the upper plungers is open on the top and forms the discharge orifice for the water; and the other is closed, forming an air vessel, which is continuously charged with air through a suitable snifting valve fitted to the side of the pump nearest to that plunger, and below the discharge valves; this snifting valve permits a small quantity of air to be drawn in with every upstroke of the pump. The steam cylinder is fitted with the Davidson slide valve.

Six of these pumps have been supplied to the Denaby Main Colliery, which will raise 300,000 gallons per hour through 300 feet. Each pump has its own winding drum and steel wire rope, enabling each or all of the pumps to be raised or lowered at will. Two shafts are being sunk to a depth of 600 yards, and four pumps are in one shaft and two in the other. Each pump has a telescopic suction pipe, which enables a depth of nine feet to be sunk without lowering the pump.

The First American Tin Mill.

The *Rapid City Republican*, in a recent issue, gives an interesting description of the Elendale Tin Mining Company's new Tin Mill, the first of its kind established in the United States, and which is now treating the product of the Dakota Tin mines. Our contemporary states that the mill is located on Iron Creek, about 22 miles south-west of Rapid City, at the foot of the mountain on which the mines are situated. The mill proper measures 50 feet in width by 100 feet in depth, and is divided into 3 stories. It is unique in plan, compact and convenient, well built in particulars and protected from all dangers of fire, both by a system of water pipes and by having roofs, etc., covered by a thick asbestos coating. Either steam or water power may be used for running the machinery. The steam equipment consists of two 100 horse power boilers and 100 horse power high speed engine. The water power equipment consists of a flume 20 inches by 24 inches in section, bringing the water from a dam on Iron Creek, a mile and a quarter distant from the mill, giving a head 100 feet pressure at the wheel. About 500 miner's inches of water are supplied to the Turbine wheel. The water power will be used except during short cold snaps in the winter, the engine being placed in the mill as reserve power in case of accidents. The ore is hoisted from the main shaft and dumped first into an ore bin of 200 tons capacity, located high up the mountain over the hill. From this bin it is conveyed to the mill by a wire rope bucket tramway, the lode going downhill to the mill, hauling the empty buckets back to the mine. The ore buckets mechanically deliver their contents into a 175 ton ore bin, above and back of the mill. The large lumps of ore are crushed, first by a Gates crusher, then passed through a drier to a set of Gates improved cornish rolls, thence elevated to a set of rotary sizing sieves. From the sieves the finer sizes are conveyed to a set of Paradox concentrating tables, and the coarser sizes to common Hartz jigs. The concentrates are, for the present, being shipped to Chicago to be smelted, but it is the intention of the company to erect at once a smelting plant on the hills. Assays and tests from the different workings gave an average of 3 per cent. metallic tin, while picked or specimen rock is often blasted out that will yield over 30 per cent. of the white metal.

An Electric Well Oil Driller.—Wesley Webber, of Pittsburgh, has been granted a patent for a new device for drilling oil wells by electricity. The new invention is a novelty, and if a success will revolutionize the modus operandi of drilling oil wells. The device is intended to supplant the use of heavy tools and do in a scientific way that which has heretofore been accomplished in a crude way. The device, as distinguished from the power in the derrick used at present, is an apparatus comprising a series of motors in tandem, connected to one another so as to practically make one motor. The reason for using the motor in tandem is to get the power within a six-inch

diameter, so that the entire mechanism, which, to outward appearances, looks like the common boiler, can be lowered in the well and the power applied direct at the bottom, which is the true place of resistance in "making a hole." Projecting therefrom is a rod which resembles a piston-rod working in and out of the cylinder; upon said rod the drill bits are firmly fastened and the apparatus lowered in the well the usual way. The entire mechanism, with a number of improvements to adapt it to drilling, is about the same as propel the electric street car, and as a number of mechanics and electricians who have seen it say, "there is no reason why the thing won't work."

Uses of Asbestos in the Laboratory.—Asbestos in its various forms is a very useful substance, and can be employed very handily in many ways at the lecture table and in the laboratory, says Professor Markoe. Shredded or carded asbestos will serve as an excellent filtering material, used just the same as paper pulp. Asbestos twine is used in binding together parts of apparatus exposed to fire and strong acids. The professor often prevented a crack in the neck of a retort or flask from spreading by binding it with asbestos yarn or twine soaked in solution of sodium silicate, and then treated with a solution of calcium chloride, a perfectly insoluble cement being thus formed. Asbestos wool mixed with solution of silicate of sodium makes a fire-proof cement of great strength, also serves to mend cracks in stoneware. It can be made insoluble by subsequent treatment with calcium chloride, silicate of calcium being formed. Asbestos paper and card can be obtained of all degrees of thickness, and can be well employed as substitutes for wire gauze and the sand bath in small operations involving the heating of glass vessels. Asbestos paper and silicate of sodium are very useful for mending cracks in glass apparatus.

Look out for the Canadian Mining Manual, now in press.



SEALED TENDERS addressed to the undersigned and endorsed "Tender for recovering roofs of Engine, Boiler Houses, &c., Parliament and Departmental Buildings, Ottawa," will be received at this office until Friday, 31st Oct., 1890, for the several works required in recovering roofs of Engine, Boiler Houses, &c., at Parliament and Departmental Buildings, Ottawa.

Specifications can be seen at the Department of Public Works, Ottawa, on and after Thursday, 23rd October, 1890, and tenders will not be considered unless made on form supplied, and signed with the actual signatures of tenderers.

An accepted bank cheque, payable to the order of the Minister of Public Works, equal to five per cent. of amount of tender, must accompany each tender. This cheque will be forfeited if the party declines the contract, or fail to complete the work contracted for, and will be returned in case of non-acceptance of tender.

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

By order,
A. GOBEIL,
Secretary

Department of Public Works,
Ottawa, 18th Oct., 1890.

WANTED TO PURCHASE,

AT A REASONABLE FIGURE,

A good Asbestos Property.

None but principals dealt with.

Address, WITNESS OFFICE,
MONTREAL.