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NOVA SCOTIA.

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EDITED BY H. PIERS

UNDER DIRECTION OF A COMMITTEE OF THE SOCIETY.

COPIES OF ALL THE SOCIETY'S TRANSACTIONS MAY BE OBTAINED ON APPLICATION TO THE SECRETARY

AT

THE ROOMS OF THE SOCIETY, HALIFAX, N. S.

1903.

CONTENTS.

(For index, see last pages).

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PROCEEDINGS.

TRANSACTIONS

OF

The Mining Society of Nova Scotia.

The Society as a body is not responsible for the opinions and views expressed in the several papers published in the Transactions.

VOL. VII. SESSION 1902-03.

ANNUAL MEETING, FEBRUARY, 1902.

The annual meeting of the Mining Society of Nova Scotia was held in the society's rooms, Halifax Hotel, on the 26th of February, 1902. The president, W. L. Libbey, took the chair at 10.30 a.m.

There were present—W. L. Libbey, Brookfield Mining Co., North Brookfield: A. A. Hayward, Waverley; George W. Stuart, Truro; Alex. McNeil, director Port Hood Coal Co., Halifax; Henry S. Poole, Halifax; Richard H. Brown, Halifax; Joseph Austen, of Austen Brothers, Halifax; George L. Burritt, Rand Drill Co., Halifax; C. H. Dimock, president Wentworth Gypsum Co., Windsor; W. C. Brine, of H. H. Fuller & Co., Halifax; J. W. Pilcher, General Electric Co., Halifax; H. A. Sanders, Halifax; C. F. Andrews, Isaac's Harbour; C. J. Coll, general supt. Acadia Coal Co., Stellarton; Harry Coll; T. R. Gue, Acadia Powder Co., Halifax; J. G. McNulty, Waverley; C. A. Meissner, Dominion Iron & Steel Co., Sydney; Duncan

McDonald, Truro Foundry Co.; Harry Piers, curator Provincial Museum, Halifax; A. S. Dunham, president Baltimore & Nova Scotia Gold Mining Co.; Charles Starr, of John Starr & Son, Halifax; Hon. S. H. Holmes, Halifax; D. W. Robb, Robb Engineering Co., Amherst; J. A. Johnson, Mutual Life Insurance Co., Halifax; Charles Archibald, Halifax; H. M. Wylde, Halifax; E. G. Poole, Jr., Halifax; Gilbert S. Troop, Black Bros., Halifax; and L. F. S. Holland, Windsor Junction.

The minutes having been read and confirmed, the financial statement was submitted and adopted.

ELECTION OF MEMBERS.

The following candidates were elected:

A. S. Dunham, Caribou; A. E. Curren, Halifax; J. R. Henderson, Halifax; Capt. John Flemming, Halifax; W. F. Jennison, (Dominion Iron and Steel Co.), Sydney; C. P. Ludwig (gen. supt. Dominion Coal Co.), Glace Bay; Alexander Dick (asst. gen. manager Dominion Coal Co.), Sydney; G. J. Partington (Dolliver Mountain Gold Mining Co.), Isaac's Harbor; William Coyne (traffic manager Dominion Coal Co.), Glace Bay; W. A. Henry (barrister), Halifax; Duncan McDonald (Truro Foundry Co.), Truro; David Baker (gen. supt. Dominion Iron and Steel Co.), Sydney; Fred P. Ronnan ("Industrial Advocate"), Halifax; Hon. Robert Drummond, Stellarton; John R. McLeod (barrister), Halifax; H. Reid Harrison, Halifax.

PRESIDENT'S ADDRESS.

THE PRESIDENT, W. L. LIBBEY.—It is a pleasure to meet this large representation of our society and of the mining interests of this province in all its branches. Our meetings in the past years have resulted not only in pleasant intercourse and, in our discussions, the sharpening of individual wits and broadening of views, but also in a concrete emphasizing of our realization of the fact that we are each of us individual units in the development of a mineral section of the world which in its possibilities is unexcelled. Slowly and surely the commercial cial world has awakened to the knowledge that here in its very geographical centre are vast and practically inexhaustible stores of coal, iron and gold, which have as yet not been encroached upon. The attention of legitimate capital is already aroused and insular prejudice is being swept away. Nova Scotia is about to believe in itself, aud when thoroughly convinced, likely many who have parted with their surplus with the enchantment of distance to lure them on, may find recompense in home investments.

Vast indeed has been the increase in the facilities of our coal mines for the mining and shipping of coal in the past year, but much greater has been the progress of our operators in removing any lingering doubts in the mind of cautious capital as to the quality and quantity of product and the commercial possibilities of landing our coals in consuming centres at rates of carriage to compete with other producers.

Extensive borings have demonstrated beyond doubt the existence of such bodies of iron ores as to foretell enormous development in this chief of nation-building industries.

While the actual output of gold bullion has probably shown no increase during the past year, owing to the unparalleled drought in the past summer, it is most gratifying to note the increasing number of operators who are systematically pursuing legitimate development work below ground; and in every case

within my knowledge, where depth has been attained in sinking, there is every prospect of abundant reward for the investment of capital. I believe that the disposition is general on the part of our operators of gold mines to-day to cease "gopher mining," and to enter upon thorough development, even if the declaration of dividends is postponed until they are fairly earned and more certain to be continuous.

Labour in the gold districts is equal in supply to the demand, and, I believe, is fairly plentiful in the coal areas. We do, however, read an occasional item complaining because Italians and negroes are gaining some foothold. In the very nature of things, if this country is to achieve in mineral development what I believe to be its proper place, labour must and will be imported. The percentage of native population which will undertake the bone-and-muscle labour necessary to meet the certain demand, will inevitably fall short of the absolute needs of the rapidly increasing mining development. The surplus of the more congested nations will surely respond to the growing demand.

In lesser numbers, but as urgently in demand, are men who can thinkingly and economically direct the large operations already undertaken. Open positions are seeking men in all classes of mining to-day, and the supply of technically educated men capable of doing practical work in our mines, is inadequate.

The technical schools are giving diplomas by the score each year to young men with good intentions, doubtless in most cases well up in various theories, but who know nothing from experience of what labour is in any part of a mine, and who are not only incapable of doing manual work themselves, but are even less capable of intelligently and economically directing the miners who can do it.

The obvious source of supply will, to my mind, be secured when we devise and put in practice a systematic method of practical technical education which shall reach the very men of

all men who have created the need for technically educated men in our mines, namely, our miners themselves. Prospectors and miners are, and always have been, the discoverers of mines and the creators of mines, and to them belongs in right and justice any help our government may ever give to technical mining education.

That our society is growing in numbers, and I sincerely believe in usefulness, is a matter that each member, I am sure, feels to be an individual satisfaction.

In conclusion, I wish to express my great appreciation of the cordial and whole-souled support given me, as president, by this society for these two years.

REPORT OF COMMITTEE ON ASSAY OFFICE, TECHNICAL EDUCATION, DEEP MINING, &c.

G. W. STUART, chairman of the committee appointed to interview the Commissioner of Works and Mines, then reported as follows :—

The special committee of this society appointed at its last meeting for the purpose of urging upon the government the following matters :—

(1) A government assay office,

(2) Technical education,

(3) Encouragement to deep mining,

(4) An improved departmental report,

(5) To revive the legislation of 1885, requiring a record of plans of the workings of all metalliferous mines,

(6) That in future appointments to the position of deputy inspector shall be subject to passing a technical examination,

(7) That the present inaccurate maps of the mines office be rectified,

(8) That all rentals be made payable on two fixed days in the year;

met and organized on the 18th inst., at 2.30 p. m. There were present—G. W. Stuart, chairman; H. S. Poole, A. A. Hayward, F. H. Mason, A. McNeil, and H. M. Wylde, secretary.

Each item was taken up and discussed, and one person assigned to place it before the Commissioner of Mines. The latter came by appointment before the committee at 4 p.m.

(1) Mr. Stuart then presented the case of a government assay office, calling the Commissioner's attention to the arguments therefor as contained in his paper published by this society. He also put in the hands of the Commissioner an itemized statement of the cost of an assay plant and its probable annual charge for running expenses. The Commissioner said he was aware the Premier had said something about the government undertaking this work, and he was very pleased to get such practical information and data which he would lay before his colleagues in the government.

(2) Mr. McNeil handed to the Commissioner the resolution passed by the executive of the society upon the subject of technical education, which is as follows:—

"*Resolved*, That the government be asked to appoint a commission composed of able, independent and impartial men who shall enquire fully into the subject of technical education and the best preliminary work as preparation therefore, as now carried on in other countries, and the method best suited to the needs of Nova Scotia."

The Commissioner was informed that in following the plan proposed by this society, the government would be doing as a number of the European governments had done under similar circumstances. The Commissioner said he regarded the suggestion as a practical one, and if adopted by the government, he would expect and be pleased to receive suggestions from this society as to some at least of the members who should compose the commission.

(3) Upon this subject, viz., encouragement to deep mining, Mr. Poole told the Commissioner that an alternative proposition

would be submitted. Either the government might remit the royalty on gold mines below 500 feet for a period of years, or some plan of subsidy to 1,000-feet shafts might be adopted. The Commissioner said the government was committed to doing something for deep mining, and urged that a definite proposal should be made. He was told that it would be submitted at the annual meeting, and the sense of that meeting obtained and conveyed to the government.

(4) Mr. Hayward urged that a better mines report be prepared, pointing to that of British Columbia as an example. The Commissioner said he realized there was room for improvement in the Nova Scotian report, but he had come into office too late to effect any change this year. He was, however, giving it attention for the future.

In respect to (8)—that all rentals should be made payable on two fixed days in the year—the Commissioner said he was in hearty accord with this suggestion, and he would ask the government for legislation to make the rentals of coal leases fall due on one fixed day, and the same with respect to gold mines; and further, that there should still be thirty days of grace for payment, but no notice.

With regard to the other matters mentioned by the committee, the Commissioner thought these pertained rather to the administration of his own office, and he suggested leaving these until the matters with which the government had to deal were first dealt with. With this suggestion the committee concurred.

GEO. W. STUART,
A. A. HAYWARD,
ALEX. MCNEIL,
F. H. MASON,
H. S. POOLE,
Committee.

GOVERNMENT ASSAY OFFICE.

PRESIDENT LIBBEY.—I think it is fair to say, in connection with the request for a government assay office, that there have been diverse opinions expressed as to whether it is desirable for this society to urge officially the creation of an office. I think probably there are members present who hold opinions on each side of the subject, and now would be a good time to hear their views.

C. F. ANDREWS.—I was looking over Mr. Stuart's paper, "Plea for a Government Assay Office," and I see such an establishment was recommended for a good many reasons. For the last reason stated in the paper, I think it was justly recommended; but I have doubts as to whether all of us could support it for some of the first reasons there presented. I was not here when the paper was read, but I looked it over this morning. The first thing I would take exception to, would be the expression, "the assaying of gold bullion produced in this province." While I can not see any reason why gold in this province should not be assayed, I fail to see any direct reason why it should, and do not know any direct benefits that would result from so doing. Take for instance gold bullion that would be assayed here and stamped with the government stamp. What good would that be to the possessor of the gold brick after it was assayed and stamped? Where is the benefit to the owner of the gold brick? If this gold brick were stamped here, I can not see that it would be accepted by the United States treasury department; it would have to be resmelted and stamped there. There has been some talk of our government purchasing these bricks; but I can not understand why it should purchase them, or what it would do with them afterwards.

I also notice the statement, a little further on in the paper, that "large quantities of the gold taken from our mines are not returned at all, and the government gets no account of them." While I have no doubt that there is more or less gold that

could be so referred to, still I can hardly agree with the statement that there are "large quantities."

There is also another statement that I disagree with, namely, that which says that "dishonest majority mine-owners ship and sell much of their gold without making any returns of it, in order to defraud minority owners." This may happen occasionally, but we very seldom hear of it. If an assay office were here, would it not be just as easy to ship gold then as now, if this statement is correct?

The paper says still further on: "From all these causes the government lose a large amount of royalty, and the province is credited with much less gold than is actually produced, and yet the whole of the ore tonnage is returned, thus causing the average yield per ton to appear much too low." This states that the whole ore tonnage is returned, but I think there is room for doubt regarding it. I do not think we should object so much when the whole of the ore tonnage is returned as when it is not returned. There is rather an inclination to cut down the tonnage than to over-estimate the amount of rock that has been handled.

The latter part of this paper calling for a government assay office would probably receive the endorsement of everybody, but I, for one, wish to go on record as objecting to the reasons given in the first part of the paper.

G. W. STUART.—I do not know that Mr. Andrews' remarks call for a reply, but I may say that I am sorry he was not present when the paper was read, so that the objections might have been made at the time and possibly it might not have been unanimously adopted by the society. I can assure you I have had good reasons for making those statements in regard to the large amounts of gold being shipped out of the province without returns being made. It is not necessary, nor would it be wise, to particularize. There is no question, however, that large quantities of gold are mined both in a legitimate and

illegitimate way, for which no returns are made to the government at all. There is also a great deal of gold stolen by the miners. I can assure you I have suffered very much indeed, myself, in the latter way, when working nugget mines. In regard to the tonnage being rendered less than, rather than in excess of, that which is actually mined, I think a number of gold-miners present will agree with me that in recent years it has been a great desire among a number of mine managers to show just how cheaply they can mine and mill ore. I am quite sure there are a number of mines in the province to-day that are doing that, and the tonnage is very closely calculated. And instead of 2000 lbs. to the ton, I am strongly inclined to hold that the larger tonnage should be given, viz., 2240 lbs.

In proposing that the government assay office should assay bullion, I had in view something in the future which is not mentioned in the paper,—that eventually the government would purchase all the gold produced in the province, and that an arrangement might be made with the Dominion Government that that gold be taken at the assayed value determined by the Provincial Government. As you are well aware, in the near future it is the intention of the Dominion Government to establish a mint. While I did not think it necessary to go that far in the paper, I also had that in view at the time.

C. F. ANDREWS.—In regard to Mr. Stuart's remarks relative to the tonnage of ore from the mines, I do not know of any mine in the province where it is cut down. It is some time since I handled any great amount of ore myself, but when I was working considerable quantities, more, probably, than any other man in the country, the returns were made at 2240 pounds to the ton, rather than 2000.

A. A. HAYWARD.—It seems to me that there is only one thing in regard to the committee's report that is now open to discussion, and that is deep mining. The other questions have been settled before the society and laid before the government.

A. McNeil.—I must take issue with two members of the committee with regard to our position. I do not think that we are half through with our work with regard to the various matters upon which the committee interviewed the government. A mere meeting with the Commissioner of Works and Mines, and giving him certain data, is doing but a small amount of what we should do. The Commissioner was kind enough to say that he would ask the whole Executive Council to meet this committee and discuss the matters. I am more particularly interested in the next matter dealt with by the committee, namely, technical education. We have not succeeded in doing anything yet, for we do not know whether the government is going to grant our request. It will be necessary for this association, with every bit of its machinery, to go to work, in order to accomplish that which we have in hand. The reason why we have met at this particular time, while the House of Assembly is in session, is that at this session they might take up these various matters and provide the machinery on the spot to best effectuate their object, not only by bringing these matters to the notice of the Commissioner, but to that of the whole of the Executive Council, and if necessary to both branches of the House. And we should also bring the whole influence of the association to bear upon the government, so as to show that the mining industry not merely requires these things, but is demanding them.

H. S. Poole.—Following the remarks of Mr. McNeil, I would like to say that if the next question to be considered—that of technical education—were postponed to a definite hour, we might get the Superintendent of Education to come before us and give us his views on the matter. I have no doubt that they would be of interest to the society as a whole.

A. McNeil.—Not only would he give us light and information, but I am sure he would support the view we have taken on this question.

Further discussion of the question of technical education was thereupon deferred till a later hour.

ENCOURAGEMENT TO DEEP MINING.

The discussion of that part of the committee's report which related to aid to deep mining was then taken up.

PRESIDENT LIBBEY.—Personally, I may say that the greatest encouragement and aid we have had lately to deep mining was the ore we struck at a depth of 840 feet.

C. F. ANDREWS.—It seems to me, if it be a good idea to remove the royalty from ore taken below the 500 foot level, it would also be a good idea to have the royalty removed from all gold. I have heard some talk lately about the possibility of that being accomplished, if properly brought before the govment.

H. S. POOLE.—It would be well to get an expression of opinion from the society as a whole as to which it favours of the two propositions laid before the Commissioner of Works and Mines by its committee; that is, whether it more particularly favours the remission of royalty on gold mined at a considerable depth, or a direct subsidy. Of course, we can only make a suggestion to the government as to the preference.

PRESIDENT LIBBEY.—I do not think I have expressed any opinion as to the subject of aid to gold mines before. I do not believe they need any at all. If there is not enough energy in Nova Scotia to go ahead and mine without government aid, all you will get will not amount to much.

A. MCNEIL—Would you favour asking the government to take off the two per cent. duty?

PRESIDENT LIBBEY.—I believe I would, but I would not ask them to do it for me. I think that if we decide to ask for anything, we could ask for the remission of royalty on gold obtained at depths greater than 500 feet for, say, a period of ten years; but I would not favour asking the government to make it perpetual. I think the mining laws in Nova Scotia today are just and equitable.

A. A. HAYWARD.—The impression now abroad of the gold measures in Nova Scotia is, that they are "spotty" and shallow, and that we have not proved that they exist at any great depth. The history of our gold mining extends over thirty years, and until the last two or three years Nova Scotia gold workings never reached below a three-hundred or four-hundred foot level, and then the operations were abandoned because it was not believed gold was in sufficient quantity to pay. During this time we have had able men in the field, such as Selwyn, Dawson, and Faribault, who have enlightened us on the subject, and who say that we have gold measures at greater depths as in other countries, and that our formation is far superior to many other gold-bearing districts. But such papers as these gentlemen have given to the mining world, have not reached the people who invest their capital in mines, and Nova Scotia is labouring under a disadvantage to-day as it did twenty years ago. With respect to the royalty, I have never heard it brought up as an objection to investing in our mines, for it is very little known that there is a royalty to pay. It seems to me, if we believe in the theories of the various experts who have been in the field, we have valuable mines, and we should endeavour to prove those theories: and the question is, is there any individual operator willing to make the attempt. In a few instances, perhaps, it might be possible to find a man who would undertake the work. In the majority of districts throughout the province, however, the general impression prevails that Nova Scotia is "spotty." If we can get a subsidy from the government for the pnrpose of sinking deeper shafts, it wouid be an inducement to capital, and an advantage to the gold mining industry. If the royalty were remitted, it would perhaps be an incentive to the owners of mines to develop their properties. If the mines gave a good output below the 500-foot level the government revenue would be increased. It seems to me that this is the only practical way of getting government

assistance, and at the same time you will be offering the government something in return.

H. S. POOLE.—I understand Mr. Hayward's remarks to be a motion, and, if so, I second it,—that this society suggest to the government that it give a subsidy rather than a remission of the royalty on gold mined at a considerable depth. In that view I concur with the last speaker, thinking his arguments as a whole are more favourable.

W. C. BRINE.—Do I understand that Mr. Poole favours asking the government for a subsidy towards sinking mines to a certain depth; and if so, whose mines are you going to choose first to sink?

H. S. POOLE.—The committee did thrash that out to some extent, and it came to some understanding on what lines it would ask the government to give assistance. It was agreed that only one mine in any one district should be aided, and the site should be chosen by the government engineer, and that no subsidy should be paid until the depth decided on was reached, and was satisfactory to all parties.

PRESIDENT LIBBEY.—How would it do to recommend that the government acquire a location, and then sink a shaft on some good prospect at their own expense; and to insist that any student who received government aid to his technical education should take a pick and shovel and help to develop the mine before he took his degree?

A. A. HAYWARD.—That is open to objection. It throws the matter into politics largely. In the method you suggest, the shaft would be sunk in the district where the largest political influence was brought to bear. We want to take this question out of politics, and make it as good for the operator as it is for the government. If the government wants to open a gold mine in connection with technical education, that is another matter.

HON. S. H. HOLMES.—It appears to me that the question before the society at present is a very important one, and there are advocates on both sides; one is an advocate for the remission of royalty beyond a certain depth, and others for a subsidy. Deep mining is a question that has been before the country for the last thirty years, and there has really been no deep mining during that time. It is very important to ascertain whether gold exists at great depths, and if it does, it enhances the value of the mines and the prosperity of the province. It appears to me that the remission of royalty would be an incentive which would work to a larger extent than anything else, because it would apply to every part of the country. It would be an incentive to every person going as deep as he could. No subsidy, on the other hand, would be of as much advantage. I think the government, in the interest of the province, should grant a subsidy to find out whether gold exists at a great depth What would be the objection to asking for the two things: first, remission of royalty, and secondly, assistance to deep mining by a subsidy in whatever way best suits the society? There would be a good deal of difficulty and dissention if a subsidy were given alone; but if in addition to that, you give a remission of the royalty for all ore obtained beyond a certain depth, I believe you would have a good incentive.

A. A. HAYWARD.—In replying to Mr. Holmes, I may say I think perhaps he has built his structure on rather a dangerous foundation. In opening up this question of royalty, it must be remembered that the government receives a large portion of its revenue from it, principally from coal. If we ask for the remission of royalty on gold, we will bring into the field the coal men, although they have not the same cause to ask for a remission on coal. It would not be wise to open up a broad question that may be the means of bringing defeat. If I was a coal man, I would not like to see the gold men getting such a remission, without something being done for coal.

A. McNeil.—When this matter was being considered by the committee, there were just two things that inclined it in favour of a subsidy, rather than of a remission of the royalty and they were these. We were asking for the remission of royalty on any depth below 500 feet. It was the idea of some of the committee that royalty was a thing that did not come into the financial question when you were endeavouring to get capital interested in the development of our mines, and that therefore it would not be of much interest to capitalists. We were asking only for a partial remission of royalty, and we were met by a letter from a prominent member of the association, saying that the government was prepared to remit the royalty if it were asked to do so by the society. We were left with this alternative, that we had to ask for something or ask what the government was willing to grant. Instead of committing the society to a request which might be questioned by the various interests, we thought it would be better to take the sum now paid in royalty yearly, viz., $12,000, and capitalize that sum, estimating money as worth 4 per cent., which would give us the sum of $300,000. Now there are twenty-five proclaimed districts in Nova Scotia; let us limit it to thirty. Say the subsidy which would be given to each shaft is $1,000, and $10,000 to to be given when a certain depth was reached. Throw around the selection of the shaft all the possible safeguards that could be thought of, with the definite object of making that shaft a proper and reasonable and likely test of the measures of the entire district, then you would have a sum of money which is very considerable in itself snd which certainly would encourage the mine operators to go on with the work; and if they were successful the government would have their return in royalty. If it were not a success, the mine owners would lose as well as the government. I thought it would be well to place before the association that view of the whole royalty question. On this question I do not feel that I am sufficiently informed regarding all its phases, and as it is an exceedingly

important one, I think it should receive your earnest consideration. We believe from the geological facts regarding the gold measures of Nova Scotia, that something ought to be done to develop them at greater depths. They have been proved in your own district, Mr. President, at 840 feet, and I am delighted to hear you say that the greatest encouragement you had was the ore you obtained at that depth. I believe that if the government were to grant our request, it would be the greatest encouragement we could place before capitalists. From what we have heard, we can safely go before the government for assistance in this matter.

The meeting then adjourned for luncheon, and met again in the Government's new building, at 2.30 p.m.

HON. S H. HOLMES.—Mr. Hayward seemed to object to the remission of royalty on gold because the government might also be asked for the remission of royalty on other minerals as well, for instance, coal. Mr. Hayward probably did not understand my proposal. Our object is to find out whether gold can be obtained in the deep, whereas we know coal can be, and is, mined from great depths. We wish to adopt the most effective method of proving the theory that gold mining can be carried on to a greater depth than it has hitherto been done, and to discover if sufficient gold can be obtained there to reward the miner. The suggestion I made was, that both the methods proposed should be employed. All gold mines should be encouraged by the remission of royalty, which would incite them all to go deeper; whereas if you confine the aid solely to giving a subsidy to some person or company or to some particular mine, you might get half a dozen to undertake the work. The government should, in my opinion, also take steps to sink shafts in different parts of the province, independent of any remission of royalty.

A. A. HAYWARD.—I move that whereas this society considers it necessary that deeper mining should be carried on in the province, therefore resolved, that as an encouragement to such mining we ask the government to grant a subsidy to deep mining, and that a committee be specially empowered to meet the government with that end in view, and that we leave the matter in the hands of the committee, to deal with the government as it considers best. This remission of royalty, of course, to be confined to metalliferous mines.

The motion was seconded by H. S. Poole and passed unanimously.

The following papers were then read :—

Remarks on Technical Education. By Dr. A. H. MacKay, Superintendent of Education. (Reproduced elsewhere.)

Notes on some of the Pyrites Deposits at Port au Port, Newfoundland. By C. A. Meissner, M.E., of the Dominion Iron and Steel Co. (Reproduced elsewhere.)

Aim and Scope of the Mining Society of Nova Scotia. By Alexander McNeil. (Reproduced elsewhere.)

J. H. AUSTEN.—I move that a committee consisting of five members be appointed to meet the government with respect to deep mining and technical education ; said committee to consist of Messrs. Libbey, Poole, Stuart, McNeil and Hayward.

The motion was seconded by C. H. STARR, and passed unanimously,

PUBLICATION OF THE TRANSACTIONS OF THE SOCIETY.

G. W. STUART.—I think it would now be well to take up the notice of motion that was made at the last meeting,—"Whether it is desirable to give to any newspaper a preference with respect to the publication of the society's proceedings."

Perhaps the chief reason for making the notice of motion at that time was to end the discussion which had taken up a great deal of the time of the meeting. A large number of the members of the society had spoken to me from time to time on this matter, and it seemed to me to be the general opinion that it was not advisable to confine our publications and transactions to one journal or newspaper. You are aware very little of our proceedings reach the local press, and the "Canadian Mining Review" has very little circulation in Nova Scotia—it is confined entirely to men who are actively engaged in mining. I am thoroughly convinced it would be better to publish our proceedings in the local press.

I want to refer to a short editorial in the December number of the "Canadian Mining Review" touching Dr. Ami's correspondence, with which you are all quite conversant.* It had been explained how Dr. Ami's letter was placed before the society, yet the editor of the "Review" states;—

"If, as Dr. Ami asserts, this letter was strictly a private communication addressed to Mr. Stuart personally and for his own information only, it is difficult to understand how it came to be discussed at an open meeting of the society. At all events the publicity which has been given to it is regretable, and has served no good purpose. The responsibility for the delay in the publication of these valuable maps of Mr. Fletcher, rests with the Director of the Geological Survey, and, as no appointment to this office has been made since Dr. Dawson's death, the proper course the society should take is to address

* See Journal of Mining Society N. S., vol. vi, p. 26.

the Hon. the Minister of the Interior. We have no doubt when Mr. Sifton learns the urgent desirability for the immediate publication of these maps, and the petty, almost childish, reasons, which have so far prevented their issue, he will have the matter rectified."

In this same publication,* in the account of the proceedings of our last meeting, it was shown very clearly why this letter (which has caused quite a little excitement in mining circles) was produced before the society. The letter is in the possession of the secretary and, as you are aware, it was addressed to me as the president of the society, and therefore I think properly it should have gone first into the hands of our worthy president; but inside it was addressed to the vice-president. After receiving the letter, I wrote Dr. Ami as follows:—

Truro, N. S., Aug. 3rd, 1901.

H. M. Ami, M.A., etc.
Geological Survey of Canada.

Dear Sir,—

I have been absent from home for the past four weeks, otherwise your letter of the 9th ult. would have been acknowledged ere this.

I think the explanation given by you for the delay in the issuing of the maps referred to, is due to our N. S. Mining Society, therefore, unless you object, I will be pleased to read your explanation at our next meeting.

I am sincerely yours,

GEO. W. STUART.

* Can. Mining Review, vol. xx (Dec., 1901), p. 286.

Such is a copy of my letter in reply to Dr. Ami, which I will hand to the secretary to be filed. Immediately following that, I received a letter, dated Dec. 2, 1901, from Mr. B. T. A. Bell, editor of the "Canadian Mining Review," and in the face of this letter, it is incomprehensible how he could publish the short editorial before quoted.

MR. STUART then read Mr. Bell's letter.

A. A. HAYWARD.—The inconsistency between Mr. Bell's letter to Mr. Stuart and the editorial in his paper, only bears out the conviction I have had for many years as to his reliability as an editor. I would be only too pleased to have the transactions of the society reported by the local press.

THE SECRETARY.—Dr. Ami's letter was referred to Mr. Hugh Fletcher, and a reply was received from the latter, which I would ask to have included in the report of this meeting.

Mr. Fletcher's statement was then read.

H. S. POOLE.—In connection with this, I suggest that the able letter written by the Secretary should accompany the reply of Mr. Fletcher.

(The Secretary's letter and other correspondence on the subject, including a statement of Mr. Fletcher's views, will be found in the "Journal" of this society, vol. vi, pp. 101–104.)

PRESIDENT LIBBEY.—Would it not be well, Mr. Stuart, for you to restate your motion?

G. W. STUART.—The motion asks the society to take into consideration the advisability of continuing our publications in one paper, or giving any paper a monopoly of the publication of our transactions, and whether our connection with the "Canadian Mining Review" should cease. I move that at the end of the present year, which is the end of the present month, the previous existing arrangement with the "Canadian Mining Review" cease and determine, and that thereafter the

publication of our transactions be given to the local papers, and that the secretary be instructed, if so desired by the editor of the "Canadian Mining Review," to send a copy of our transactions to him as early as possible after each meeting, that he may be in a position to publish them if he desires.

J. A. JOHNSON.—I second the motion.

PRESIDENT LIBBEY.—I would like to ask if you intend that your motion should cut off the society's subscription to the "Canadian Mining Review ?"

G. W. STUART.—Most decidedly. The present agreement between this society and Mr. Bell should cease and determine this present year.

C. A. MEISSNER.—Aside from the idiosyncrasies of Mr. Bell, which are annoying, I think the "Mining Review" is a very interesting paper.

A. MCNEIL.—It is unsatisfactory to have it as an organ of this society.

HON. S. H. HOLMES.—I do not think he gives as much attention to Nova Scotia as he does to the west.

PRESIDENT LIBBEY.—Mr. Bell writes to me that our gold miners will not tell him what they are doing.

A. A. HAYWARD.—Perhaps the gold miners may have a just reason for doing so.

The motion was put and passed unanimously.

DELAY IN PUBLICATION OF GEOLOGICAL SURVEY MAPS.

J. A. JOHNSON.—I move that the executive of this society write to the Minister of the Interior, relating all the circumstances in connection with this correspondence, and demand that the maps be published forthwith. I have got all the geological reports for years, and it is extremely difficult to understand them when there are no maps accompanying the text. As citizens of Canada we are contributing our share to the department. For many years they have had men all over this country, and principally in Cumberland county, and whether it is influence that is brought to bear to prevent these maps being published, I know not.

H. S. POOLE.—Dr. Bell, who is now the acting director of the Geological Survey, will be in Halifax to-morrow night. Some of us may have an opportunity of seeing him. I have heard that Mr. Hugh Fletcher was called to Ottawa, in order that he might supervise some of the maps. Dr. Bell has come to the decision to issue the maps as soon as possible. He has only been acting since the death of Dr. Dawson, and the office cannot be charged with the long delay of which we have been complaining.

G. W. STUART.—I had some correspondence since this little incident took place in connection with Dr. Ami's letter. The last communication I had on the subject is dated December 12th, 1901, a portion of which reads as follows :—

"It is of course difficult for an outsider to follow all the ins and outs of such a discussion, but we feel sure that the Mining Society of Halifax will see that justice is done to all concerned in so far as is possible. As regards the publication of the N. S. maps, these might have been in our hands years ago, had not this foolish and now unseemly squabble, which to a large extent originated on personal grounds, been started. I fancy from the assurance of the Acting Director, as given in the telegrams to

Mr. Wylde, that they will be issued as speedily as possible and that they will be satisfactory when so issued. The careful work done by Mr. Fletcher in that area is a sufficient guarantee of that.

Thanking you for your communication,

I am, yours very truly,

R. W. ELLS.

C. STARR.—I second Mr. Johnson's motion.

The motion passed unanimously.

EDITING THE TRANSACTIONS OF THE SOCIETY.

A. A. HAYWARD.—As we have terminated our connection with the "Canadian Mining Review," a new duty has to be performed by some of the members of this society, and that is the editing of the transactions. Now, I assure you that this is a considerable duty which has to be performed, but it must be done, and should be done well. I would like to hear some expressions of opinion, but in the meantime I move that we have an editor, and I would like to propose for that position Mr. Harry Piers, with a remuneration, and that he be assisted by Mr. McNeil and Mr. Poole. I think then we would have a publication creditable to the society.

C. A. MEISSNER.—I second the motion.

A. MCNEIL.—I would like the mover and seconder to agree to add—"that Mr. Piers be also the librarian of the Mining Society, and that the executive be empowered to arrange with Mr. Piers as to salary."

The motion passed unanimously.

DEATH OF A MEMBER.

THE SECRETARY called attention to the death of James F. Lewis, and moved that a letter of condolence be sent to his family.

G. TROOP seconded the motion, which passed unanimously.

ELECTION OF OFFICERS.

Officers for the ensuing year (1902-3) were elected as follows:—

President—George W. Stuart. *Vice-Presidents*—Alexander McNeil, A. A. Hayward, C. A. Meissner. *Council*—C. F. Andrews, Isaac's Harbor; A. Dick, Glace Bay; Charles Archibald, M. R. Morrow, Joseph H. Austen, Hon. S. H. Holmes, F. H. Mason, T. R. Gue, Halifax; C. H. Dimock, Windsor. *Secretary*—H. M. Wylde, Halifax. *Auditor*—C. C. Starr, Halifax.

Mr. Libbey vacated the chair amid the applause of the members, and applause was also accorded Mr. Stuart as he took the presidential position. The latter expressed his thanks for the honor done him.

On motion of Alexander McNeil, the thanks of the society were extended to the retiring president, a vote of thanks which, he said, was not a mere matter of form. Mr. Libbey's services had been of inestimable value, a fact which the future would demonstrate more completely than does the present. Mr. McNeil referred to what he described as Mr. Libbey's able, striking, and valuable annual addresses. The motion was seconded by C. A. Meissner, and was acknowledged by Mr. Libbey.

Before adjourning, F. W. Green, who goes to Mexico, spoke a few words of farewell to the society.

ANNUAL DINNER.

In the evening the annual dinner of the society took place at the Halifax Hotel.

MEETING, OCTOBER, 1902.

A meeting of the society was held in the Government's new building, Halifax, on the 8th of October, 1902. The meeting opened at eleven o'clock, with the president, George W. Stuart, in the chair.

Among those present were: Pres. George W. Stuart, Henry S. Poole, E. R. Faribault and Hugh Fletcher of the Geological Survey of Canada, Ottawa; Professor J. E. Woodman of Dalhousie University; R. H. Brown, Halifax; Clarence H. Dimock, Wentworth Gypsum Co, Windsor; Alex. McNeil, barrister, secretary Port Hood Coal Co.; A. A. Hayward, manager Golden Group Mining Co., Waverley; H. A. Sanders, Halifax; Professor George W. Maynard and son of New York; W. L. Libbey, manager Brookfield Mining Co., Brookfield; Duncan McDonald, Truro; George L. Burritt, Halifax; D. C. Hood, Halifax; F. A. Ronnan, editor "Industrial Advocate," Halifax; Hon. R. Drummond, editor "Maritime Mining Record," Stellarton; Geoffrey Morrow, of Stairs, Son & Morrow, Halifax; J. H. Austen, of Austen Bros., Halifax; J. E. Hampson, Halifax; F. H. Mason, assayist, Halifax; J. A. Johnson, Halifax; G. S. Troop, Halifax; H. M. Wylde, Halifax; Harry Piers, curator Provincial Museum, Halifax; and Hon. S. H. Holmes, Halifax.

The SECRETARY read the minutes of the last meeting, which were confirmed.

On motion of H. M. WYLDE, seconded by A. A. HAYWARD, the following candidates were elected en bloc: Joseph W. Revere, James H. Whitman, P. R. Curtis, Robert Kaulback, Samuel R. Heakes and George E. Faulkner.

TECHNICAL EDUCATION.

The following report of the society's committee on technical education was presented by ALEX. MCNEIL, chairman :—

It may be desirable to go back and refer to the work that was done at the outset in connection with this subject. We first took up the matter on the 10th of April, 1901, when the society committed itself to the advocacy of more and better technical instruction for the province of Nova Scotia—and after a lengthy discussion it was resolved—

"That the papers on a Plea for a Government Assay Office and on Technical Education have the unanimous approval of the society;

"Further resolved, that said papers be printed and a copy thereof mailed to each of the members of both houses of the Legislature;

"And further resolved, that the society respectfully requests the attention of said representatives to these important subjects, and desire that they may receive a committee of this society in regard to these subjects at an early date during next session of the Legislature;

"And further resolved, that the said committee have power to confer with the government with a view to preparing such legislation as will best carry out the objects of this resolution."

The following were appointed a committee to further the purpose of the resolution, viz., President Libbey, Messrs. Stuart, McNeil, Poole, Mason, Holmes, and G. Morrow. On the 9th of January, 1902, the council of the society resolved,

"That the government be asked to appoint a commission composed of able, independent, and impartial men, who shall enquire fully into the subject of technical education and the best primary work as a preparation therefor as now carried on in other countries, and the method best suited to the needs of Nova Scotia."

Messrs. Poole, Libbey, Hayward, Stuart and McNeil were appointed a special committee to forward this subject. On the 18th of February, 1902, the committee met the Honourable Commissioner of Works and Mines to discuss this and other subjects named by the society, and the need for technical education and especially the policy of the society was urged upon him.

At the last annual meeting of the society held on the 26th of February, 1902, Dr. A. H. MacKay, Superintendent of Education, was invited to address the society, and he did so. In his remarks he favoured the policy adopted by the association.

On the 19th of March, 1902, Messrs. Poole, Wylde and McNeil, by request of the chairman, E. M. Maconald, M. P. P., attended before the committee of the Legislature on mines and minerals to urge the policy of the society upon their attention. Subsequently that committee reported to the House of Assembly on this subject as follows:

"Your committee consider that in view of the extensive development of our mining resources which has begun, and we believe will go on with increasing rapidity, the demand for intelligent and practical operators has increased, and will still further increase. They recognize the great desirability and importance of extending and further providing the means by which our own people may be equipped in Nova Scotia to all the positions that will be opening up with increasing frequency, and for directing this development. A delegation of the Nova Scotia Mining Society appeared before us and pressed the importance of providing in as full a degree as possible the advantages of technical education in the province. A great deal could be done immediately in making more efficient and complete the advantages afforded by the mining schools now in operation, and we recommend the consideration of this phase of the subject to the favourable attention of the government.

"The problem of providing a complete system of technical education for the province, and of adapting the system to our public schools, is a large and important one, and we deem that

the fullest investigation and greatest care should be exercised in moving in that direction. We feel disposed to recommend that the government should follow the course adopted in other countries which have inaugurated the system, and should appoint a commission with full power to deal with the whole question and make the fullest examination and report to the government the result of their investigations and their opinion thereon with a view to future action by the province at an early date."

That report was unanimously adopted by the House of Assembly. On March 22nd, 1902, the same representatives of the society, by request of the chairman, J. H. Sinclair, M. P. P., addressed the committee of the Legislature on education; and their report, dated March 25th, which is very full and carefully prepared, is as follows:

"To the Hon. Thomas Robertson, Speaker of the House of Assembly.

"The committee on education beg leave to report as follows:

"Your committee have had under consideration the necessity of reform in thee ducational system of the province, in the direction of simplifying existing methods and of giving greater prominence to manual training and technical education, and ask leave to report as follows:—

"Your committee are inclined to the opinion that the schools of this province as at present conducted are too much absorbed in book work and in verbal studies, which seek to train the memory only, but which fail to give adequate discipline or to fit the pupil for skilled labour or practical life.

"Your committee do not wish to be understood as reflecting in the least on the men in charge of our educational system. The defects in the system are a legacy that has been handed down to them from the past, and will take time and patience to remove, and we feel certain that the Superintendent of Education and the teachers throughout the province will be glad to embrace any opportunity that may be offered to effect the necessary reform. It does not require to be stated that good results

have followed from our present educational system. In some respects it is still satisfactory. In others there is reason to fear that it is deficient.

"It will not be denied that our schools should as far as possible prepare the scholars for an intelligent apprenticeship in the calling that is to yield them a livelihood. The child's education should cultivate a taste in him for his future work. The apparent inability on the part of the pupils to turn the results of the work done in the schools to practical every day use, is the defect that in many quarters is charged against the existing system. Can the present system be improved, and how is that improvement to be brought about? Has the province received the best possible value for $844,762 that it spent last year for the support of education? Are the schools of this province doing all that is possible for schools to do to equip the pupils for the practical work that so many of them must take up year by year? These are questions that should be frankly asked, and no attempt should be made to shirk or evade the answers. Your committee are well aware that it will take time to bring about any radical change. The existing methods must, to a large extent be adhered to for some time to come, but we see no reason why the foundation for manual and practical instruction should not be laid in the elementary schools of the province, and by degrees the present system could be simplified, and without any great disturbance a most necessary reform be brought about. Such a change would in the end have the effect of benefiting rather than detracting from the literary education of the pupils, and it would certainly help to expand their faculties, quicken their intelligence, and fit them better for their work in life.

"Your committee cordially sympathize with the proposal to give provincial aid towards the establishment within the province, as soon as we are in a position to do so, of advanced technical and industrial schools to educate and turn out industrial leaders capable of undertaking the developing of the resources and the

building up of our industries, but there is reason to fear that the establishment of such institutions at the present juncture might cause failures, among other causes from the lack of students having the necessary preliminary training, and while we set no limit on the progress of the future, it may for the present be the wisest course to take the initial step in the elementary public schools. We have no doubt that as soon as we have a sufficiently numerous class of students demanding the higher technical training, that demand will meet with a ready and cordial response.

"The growing necessity for trained and capable men is apparent to everybody who is familiar with industrial conditions in this province. Our gold mining industry for example is said to be suffering for the lack of suitable men. Mining operations are too frequently undertaken by men of defective training and lacking in knowledge of local conditions, and by the time they have acquired the necessary experience at their shareholders' expense, they have exhausted the capital at their disposal, ruined the venture and brought discredit upon an important industry. There is ample room, and not only ample room, but an urgent demand in Nova Scotia at the present time for trained men—captains of industry—men of energy and ability, men having the skill and enthusiasm requisite to undertake and carry on the important task of developing the great natural resources of this province. These men should be produced among ourselves. We have the raw material in ample measure, and our success in producing the finished article must always depend to a very large extent on the efficiency of our educational system. We do not forget that the remodelling of our education system on the lines indicated in this report will involve the expenditure of more money, but if this province is to become, as we all hope it will become, a great mining and manufacturing country, the question of money must not stand in the way of equipping our young people for the task of developing our resources and building up our industries.

"Your committee feel that they have performed their duty when they have called the attention of the government and legislature to this most important subject. The questions referred to in this report are far too important to be dealt with hurriedly. The only recommendation your committee would venture to make is that the government would consider the question of appointing a commission, to be made up of the most eminent men available, to make a thorough investigation into the workings of our present system, to take evidence, collect information, and after a careful consideration of the whole question to report the result of the enquiry for the future guidance of the government and legislature."

That concluded the active work done by the representatives of the society, and it remains for the Mining Society to say whether the work of endeavouring to get a commission should be continued. In order to bring before the society to-day the amount of progress in manual training in the province, I wrote to Professor Kidner, director of manual training schools for Nova Scotia, and his reply is as follows:—

Truro, N. S., Oct. 6th, 1902.

A. McNeil, Esq., M. A., Halifax.

Dear Mr. McNeil,—

I have your letter of Saturday last and have much pleasure in giving you all the information possible. As, however, I only arrived from England last week I have scarcely collected all the threads of my work yet.

Last year (1901-2) the following places had manual training schools in operation:—Halifax, Truro, Yarmouth, Wolfville, Pictou, Antigonish, Bridgewater, Lunenburg, Deaf and Dumb Institution, Halifax, and two Industrial Schools there also. All these schools were most successful and the public and school authorities are alike pleased. The school inspectors report that the general work does not suffer, and in some subjects is actual-

ly improved. The drawing especially is useful to those who are likely to be engaged in industrial pursuit.

For the forthcoming session the following towns have signified their intention of starting in the near future. *Windsor, *Kentville, Bridgetown, Annapolis, Digby, *New Glasgow, Sydney, Sydney Mines, North Sydney, and Glace Bay.

The towns "starred" have commenced, and the others are arranging rooms, and I trust will be able to take the subject up some time this winter.

I have been visiting some of the English "higher grade" and "organized science" schools, and I have to report to the education department on them. It will result, I hope, in something being done in the way of making our present high school system a better step in the ladder for higher technical education.

The new Halifax manual training room is to be formally opened on the 15th inst., when I shall hope to see you.

Yours very truly,

T. B. KIDNER.

It will be seen that active progress is being made in manual training, which is one of the features connected with the proper elementary instruction leading up to technical education. You are also aware that an important step has been taken by Dalhousie University in organizing a school for higher technical training. But the work laid down for itself by this society is one that still should be continued, and that is the work of inducing the government to make a sufficient enquiry as to the best way of fitting the present educational system of Nova Scotia with better technical instruction. We have asked that the government should appoint a commission for the purpose. You will see by these reports of committees of the legislature, that not only were they unanimous reports from the committees on mines and minerals and education, but both the reports were

unanimously adopted by the House of Assembly. So it would seem to be only a matter of time until we get the commission.

There is just one other point I would like to bring before you. That is to call the attention of the society to the fact of the great demand to-day for college-trained men in the leadership of industrial pursuits. I am going to read you a couple of paragraphs recently written by the head of Sibley College, Cornell University, one of the greatest of the great industrial colleges of the United States. Professor Robert H. Thurston says :—

"But the young man who would win a place among the leaders of the industrial army in this century,—who would be a directing captain instead of a private marching blindly in the ranks, must equip himself for the battle with a vigorous training. Unless he has had a university education, or the scientific training of a college of engineering, he will find himself sadly handicapped. The captains of industry of the last century rose from the ranks, because an engineering education could only be had in the shops, but within a few years, technical education, under wise government patronage, has made great strides, and a young man can learn, by the time he attains his majority, more than his father could have hoped to master in years of practice.

"'Whatever you would have appear in a nation's life, that you must put into its schools,' says an old German motto, and it was Germany that proved to the world the inestimable value of training young men for industrial careers. Even the rich nobles no longer look upon labor as degrading, and, as everyone knows, every Hohenzollern learns a trade. The germ of the technical college was the foundation of the famed École Polytechnique in Paris a century ago. Every great nation now has a system of technical education, and America, with characteristic vigor, has taken the lead, and the system of engineering education, as developed at Cornell University, is now the model for the world. Not only are we training our own young men for engineering careers, but the bright young men of all other

progressive nations are coming to America to be educated. The proposed French technical school in America is an indication of the foreign estimate of the American system. Andrew Carnegie, although a shop-trained captain of industry, will give a large part of his fortune to founding a technical school in Pittsburg, Pennsylvania.

"Founded as a 'land-grant college,' to 'promote the liberal and practical education of the industrial classes,' Cornell has rapidly grown to be one of the world's great universities, as broad in its organization as Ezra Cornell would have it when he made his famous declaration, 'I would found an institution where any person may find instruction in any study.' In the early years of the university, a college graduate was considered as a man who might make his way in the world despite his higher education,—the popular idea being that a college education was only a luxury that the well-to-do might have. The colleges were not keeping pace with the country's growth. Even in very recent years there have been discussions, in which men of national prominence have joined, as to the relative merits of the college-bred man and his fellow who took up life's serious work on leaving the common school.

"The present cry is, give us college men. From all the United States, from distant foreign countries, letters come to my desk,—from the railways, rolling mills, shipyards, mines, electric shops, locomotive works,—asking for Cornell's bright young men. Not long ago a college-bred man had to seek work; now his services are sought on all the great fields of industry. Cornell has proved to practical men, to the self-made captains of industry, that her professional trained graduates are to be the future captains of industry. In such centres of activity as Pittsburg, college men are taking up the work begun by the shop-trained workers of a few years ago."

The same story could be written from the University of Chicago, and that makes our work of pressing this subject more important.

A. A. HAYWARD.—I move that the society adopt the report of Mr. McNeil.

J. H. AUSTEN seconded the motion, which passed unanimously.

A. MCNEIL.—Will the society recommend further action? The committee's report only shows that certain work has been done. What the society wishes to have done has not yet been accomplished.

PRESIDENT STUART.—Perhaps we could take that up a little later. We are to have a paper on this subject of technical education from Dr. Woodman, and also some discussion in connection with recent cases of gold-stealing. Perhaps we will not take further action in connection with this subject until both matters have been before the society.

GOVERNMENT ASSAY OFFICE.

PRESIDENT STUART.—In connection with that committee, were we not also to present our claims to the government assay office? I believe I was the chairman of the committee, but other duties I had to attend to prevented me from joining the members of the committee when they met the government. I was in hopes that perhaps Mr. McNeil would be able to report also on that matter.

A. MCNEIL.—I think the only time the committee met a representative of the government, was when the Commissioner of Mines was present, and I am under the impression that you attended on that occasion.

PRESIDENT STUART.—That has already been reported on at our last meeting. Then I might say that as regards that question there was nothing done. None of the suggestions made to the Commissioner on that occasion have been acted upon by the government,—with perhaps one exception, that of having a fixed date for the payment of rentals. This system of having a

fixed date for the payment of rentals is, I presume, of very much more benefit to the Mines Department than it is to mining men, as it reduces its office work very materially.

A. A. HAYWARD.—I think they also recognized the deficiency in the Mines Report, and promised to do better in the future, but I believe we have had that promise for several years.

TECHNICAL EDUCATION.

DR. J. E. WOODMAN, of the Dalhousie School of Mining, then read a paper entitled "Some Aspects of Technical Education." (Reproduced elsewhere.)

After some discussion on the matter of technical education,* on motion of the HON. R. DRUMMOND, seconded by A. A. HAYWARD, the following gentlemen were appointed a committee to still further advocate the views and position of the society on that question before the government: Messrs. McNeil, Poole and Drummond.

A. MCNEIL then asked if it was the intention of the society to adhere to the position and policy that it had already adopted as laid down in the resolution passed by the society; and after some further discussion, it was moved by A. A. HAYWARD, seconded by W. L. LIBBEY, that the committee be empowered to carry out the former resolution of the society.

G. MORROW.—I would ask to have added to the resolution, that this society requests the committee to discuss with the government the question of arranging for formulating some system that can come into use at an early date to enable technical education to be obtained at a small cost by some of our present working miners.

The resolution passed unanimously.

HON. R. DRUMNOND.—I give notice that at our next meeting I will move a resolution that this society endow a scholarship for one year in the Mining School of Dalhousie College.

The meeting adjourned for luncheon, and met again in the afternoon.

* See the discussion following Dr. Woodman's paper, on a subsequent page.

STEALING OF GOLD.

PRESIDENT STUART.—Mr. Robert Kaulback, the manager of the Touquoy mine, had known that he was losing gold for some time from a very rich lead he was working. Finally his plates were robbed, and on making enquiry he found that a man in the district of Caribou, six miles from Moose River where the Touquoy Mine is situated, had been making a business of buying gold. This man formerly did a little blacksmithing work in connection with his more lucrative profession of buying gold, but the latter business became so profitable and took up so much of his time that he gave up blacksmithing and devoted the whole of his time to purchasing gold. It was found that he had on his premises all the appliances for amalgamating, retorting and smelting. It was discovered where he had been selling considerable quantities of gold in Halifax, and papers were taken out for him. Detective Power assisted Mr. Kaulback in finding all the apparatus in the man's well equipped establishment. He was brought before the county court judge, and notwithstanding it was proven that he had been in this business for a long time, that he had sold large quantities of gold in Halifax, and that he had paid no royalty on any part of the gold he had obtained, nevertheless there was no law to convict him, and the result was that he escaped.

This incident brings very forcibly to our minds the fact that in this respect the law is defective. A legitimate miner has to take out a mill license, if he is the owner of a mill; and he has to pay two per cent. royalty. If he does not pay the royalty his lease is forfeited; and there are some other penalties attached which are quite severe. But a man with a mortar can extract as much gold as he pleases and it is not incumbent upon him to make any returns. The most effectual remedy for this illegitimate business has been suggested in a paper read before the society some time ago—namely, the establishment of an assay office.* I regret to say that the government has taken

* See Journal of Mining Soc. of N. S., vol. vi, p. 53.

no action in the matter. Now the question is, how forcibly can we bring this subject to the attention of the government? Can we not by some means prove conclusively that the fact of these defects in the law, and their refusing to comply with our unanimous request for the establishment of this office, is not only a great loss to the province in general, but is entailing a heavy loss upon a great many of the mining men? I am quite sure you can all speak very forcibly on the subject, and some of you, no doubt, very feelingly.

W. L. LIBBEY.—I think we thrashed out the matter pretty well before. It is unfortunate that we could not make an impression upon the government.

HON. S. H. HOLMES.—What was the remedy suggested?

W. L. LIBBEY.—Mr. Stuart set forth the pleas in a paper on the establishing of an assay office, read before the society.

HON. S. H. HOLMES.—A person purchasing gold could ask the seller where he got it.

W. L. LIBBEY.—One of the troubles is to get someone to ask the questions.

HON. S. H. HOLMES.—If he was suspected of stealing it, he should be brought before a magistrate.

W. L. LIBBEY.—The statutes prohibit the receiving of stolen gold.

A. A. HAYWARD.—The great difficulty is to identify the gold.

W. L. LIBBEY.—Another trouble is the sentimental feeling in regard to gold that is in some people's minds. For instance, I heard the prosecuting attorney of Queens county, conducting a case against two men who had stolen gold, and who acknowledged that they had stolen it; and in making what I supposed was a plea that justice be executed on one of the men, he indulged in remarks after this fashion:—"Your honor, it is true that a great many people more or less believe

that treasures freshly rescued from nature's storehouse like this do not belong to one man alone, but the public generally have an interest in them, and therefore it might be advisable to be lenient with this man." The judge was lenient with him, for all he got was six months.

PRESIDENT STUART.—I think the remedy is largely in the hands of the government. In the particular case referred to, a reputable house in Halifax admitted that they had bought during the past year two thousand dollars' worth of gold from this one man, for which they were not obliged to make returns. It was no part of their duty to make returns. This man had to admit that he made no returns, consequently there was no royalty paid. Now, one of the clauses in the paper I read before this society sometime ago in reference to the establishment of a government assay office, was as follows:—

"On the establishment of such an office several new clauses would be required to be added to the Mines Act. 1st.—Making it compulsory for all gold to be sent to the government assay office, where it will be assayed, weighed and stamped. 2nd—All gold smelted or unsmelted, found in the possession of any person not a mine owner, or an authorized mine, express, or bank agent, and in course of transit to the government assay office, to be confiscated and to become the property of the government, unless such gold has been found to have been stolen, in such a case, it shall be returned to its rightful owner."

There is no difficulty about the government amending the laws.

A. A. HAYWARD.—I think we were informed by the Commissioner of Mines that such a law could not be passed by the Nova Scotian government, it being a matter for the Dominion to deal with.

HON. R. DRUMMOND.—I believe the government, if pressed, would pass a measure of such a kind.

F. RONNAN.—There can be no doubt the Nova Scotian government has the right to enact a law to safeguard its minerals.

H. S. POOLE.—Some thirty-three years ago a Dominion statute was passed with respect to the possession of gold that had not been reported to the mining department. That statute was acted on for a time.

D. MCDONALD.—Is it not now a criminal matter for a person to dispose of a brick of gold without having paid royalty ?

PRESIDENT STUART.—No.

D. MCDONALD.—Then a prospector can mortar out all the gold he wants and the government has no claim for royalty.

HON. S. H. HOLMES.—I think it would be better to again refer the matter to a committee, with instructions to confer with the government.

It was moved by A. MCNEIL and seconded by HON. S. H. HOLMES, that Messrs. Poole, Drummond and Kaulbach be a committee to wait upon the government to again impress it with the necessity of the establishment of a government assay office.

The motion passed unanimously.

DEEP MINING.

E. R. FARIBAULT of the Geological Survey of Canada. made some very interesting remarks on the outlook for the successful carrying on of deep-mining in Nova Scotia, and laid on the table plans showing the operations of the Bluenose Gold Mining Co., Goldenville, as illustrating the general formation.

PRESIDENT STUART.—I was talking to the manager of the Bluenose Mine a few months ago. He then said, "Our Springfield lead is not showing as good values as formerly, although it has paid us very well." But now he says, "We are all right for the next ten years anyway." I can assure you the

company is showing its confidence in the mine by putting additional large improvements on the surface. I feel justified in having persuaded Mr. Faribault to be present at this meeting. I think we are all amply repaid by hearing his remarks.

C. H. DIMOCK.—As Mr. Fletcher of the Geological Survey is also present at this meeting, I am quite sure that we would all be pleased to hear from him with respect to the possibilities of obtaining oil at Cheverie, in Hants Co., N. S.

H. S. POOLE spoke about the excellent work done by Mr. Faribault in the Cambrian rocks, and by Mr. Fletcher in the later formations, and referred to the splendid maps furnished by the Geological Survey Department as the result of the good work of these two gentlemen. The maps of Nova Scotia were more complete in detail, both topographical and geological, than those of any other province of the Dominion.

CHEVERIE OIL TESTS.

H. FLETCHER (of the Geological Survey of Canada.)—I have not even the advantage that Mr. Faribault had of having with me a plan or section of any of the work I have been doing lately, and I am sorry to say that it has not yet been attended with the results we ultimately expect. I have been working on the Carboniferous and overlying rocks of the Joggins section. To see the trouble which such work involves, one has only to look at those sections where the exposures are plain, and try to follow their position. From the top to the bottom the rocks look alike, and as the top is separated from the bottom by about 15,000 feet, you all will see the difficulties we have to contend with. The results of our investigations are in abeyance. With respect to oil in the district of Cheverie, Hants Co., I may say that many years ago Prof. H. Y. Hind's attention was called to the occurrence of oil in the plaster quarries at that place. When the plaster was broken by a blast, or bad drilling, a strong smell of petroleum was noted. When a blast was set off, little

bubbles of petroleum were released and showed in the pieces of stone, and ultimately discolored rock was found. Prof. Hind made a report on this and concluded that the oil came from the dark shales called by Dr. Dawson the Horton Shales in Nova Scotia and the Albert Shales that underlie in similar localities and over a great area in New Brunswick. He strongly recommended the testing of these shales by a bore-hole near the Cheverie Brook, and he was, I think, justified in so advising. Of course it was more or less a speculation, perhaps pure speculation. But we must remember that these shales in Albert County had yielded one of the most highly bituminous materials we have any knowledge of, namely Albertite, and near the same place there is a great thickness of the shale so highly charged with bituminous matter that at present works are being organized to distil oil from it, and the material is said to be richer in oil than the celebrated Scotch shales. So I think that under the circumstances we are justified in putting down deep bore-holes for shales, to ascertain if there are other deposits of Albertite, or whether there may be oil in fissures. Mr. H. S. Poole has visited the home of these highly bituminous shales in Albert County, and he knows a great deal about their conditions. One reason why I think they could be investigated in Hants and Kings Counties with more chance of finding oil, is that the rocks lie at a very low angle. These rocks are not broken, and the oil, instead of having all escaped, may still be kept in by the overlying rocks. I think that if the operations are conducted carefully and skilfully, Cheverie is well worthy of trial.

There is another occurrence that I might have referred to, namely the oil which escapes at several points, notably at Memramcook, from the Albert shales, and gives promise of some large reservoir of oils derived from similar shales. But as I said before, it has so far been a mere matter of speculation. From the history of some of the oil deposits in Texas and California, perhaps we are justified in hoping that large deposits

may yet be found in Nova Scotia. I thank you for your kindness, and for your warm reception.

PROF. G. W MAYNARD.—I think from what Mr. Fletcher has stated there is much encouragement for you. You will remember in the early seventies Prof. Silliman in the neighborhood of Los Angelos, predicted that if explorations were carried on there they would get petroleum. His statement was not taken seriously, and so nothing was done. I went first to Los Angelos in 1879, and I have been going there ever since, with an intermission of a year or so, and know that they still continue to discover oil. The beautiful city of Los Angelos will soon cease to exist, because there are thousands of derricks encroaching now on that beautiful city.

On motion of HON. S. H. HOLMES, seconded by A. A. HAYWARD, a vote of thanks was passed to E. R. Faribault and Hugh Fletcher of the Geological Survey of Canada, for the very interesting and able remarks they had given the society.

PROF. G. W. MAYNARD then delivered an address on "Mines and Mining in Nova Scotia." (Reproduced elsewhere.)

CHARLES FERGIE, M.E., presented a paper on "Ventilation." (Reproduced elsewhere.)

On motion the bye-laws were suspended and Messrs. Spiers and Coyne of the Waverley Gold Mining Co. were elected members of the society.

On motion Alexander McEachren, Peter Christianson, John Cadegan of the Dominion Coal Co., and Norman McKenzie of the Inverness Ry. and Coal Co., were duly elected members of the society.

On motion, Messrs. Wylde and McNeil were appointed a committee to revise the bye-laws.

MINERAL EXHIBIT AT HALIFAX.

A. McNEIL.—I would like to make a suggestion to the members of this society. Would it not be well sometime next year to undertake a mineral exhibit in the city of Halifax, showing the minerals of Nova Scotia? If such a thing were going to be undertaken, it would involve a good deal of work, and would have to be begun early. We have with us to-day Mr. Johnson who knows a great deal of exhibitions and of their value.

J. A. JOHNSON.—The poor success in certain lines of the annual provincial exhibition has been altogether on account of the men who are in charge of the various departments. They have been on trial from 1895, and they should now retire, or those in control of the exhibition should have sense enough to tell them to retire. Take the manufacturers' building as an example of the management. The man in charge does not seem to take an interest in it. When Mr. Jones or Mr. Smith comes and wants a certain location, the gentleman in charge tells him "You can have that spot there." But he does not see the necessity of working hard to get interesting things to fill the building and entertain the public. One of our main exhibits there could be the product of our mines, and it would open the eyes of the people of Nova Scotia. When I was at the Paris exhibition, the Transvaal government had a mill there in operation. They brought all their quartz from the Transvaal, and it was a wonderful exhibit. They had a magnificent plant in which the spectator could see the rock go in, and the gold come out. I induced two men to go up to Mount Uniacke, the other day, and they saw the mill which Sheriff Archibald had working there, and which produced 210 ounces last month, although possibly one-half of the values went into the swamp at the back of the mill. It was very interesting to see even that old-fashioned mill.

In referring again to the class of exhibits to be made at the exhibition, I may mention the exhibit which could be made by

the sugar refinery. It could show all the different grades of sugar down to the refined article. The directors of the exhibition should not allow in their building the sale of cheap jewelry, because it is against the trade of the merchants of the city of Halifax. I would like to have the management of the building for one year, and I would spend two or three months in preparing for it and writing to people. Mr. Coll was apparently very much annoyed that the Dominion Steel and Coal Companies had a very interesting exhibit, which everybody went to see, as they also went to view the gold exhibits up stairs. Mr. Coll said if he had known there was to be an exhibit of this nature, he would have sent the specimens he had shown at the Glasgow exhibition. There could have been exhibits from every mine in Nova Scotia. Instead of the resources of the province being shown, there was an exhibit of cheap-jack stuff. The resources of Nova Scotia are certainly not advertised in Nova Scotia as they should be.

PAPERS.

Leading to Technical Education.

By A. H. MACKAY, LL.D., Superintendent of Education.

(Address delivered February 26th, 1902.)

I thought I was merely to listen to the discussion of a resolution with the liberty of making remarks or answering questions. I have seen Mr. McNeil's resolution just a minute ago, and if I must speak first, can only lead up to the main question in a general manner.

To commence by establishing technical institutions from the top is a very difficult task, as well as a dangerous process. A false step made may handicap us for the future; for rather than undo a wrong beginning we might be compelled by the force of circumstance to keep patching it up without making it much more efficient. I cannot speak for the government, but I can tell you what the disposition of the government is, as illustrated by what it has been doing. There is a safe place to begin building up a technical system, and that is from the bottom; so that when the top comes to be placed, there will be an effective foundation for the whole.

The first tier of the foundation was the introduction of "nature study" into the schools. This did not require the introduction of a new book: for the book was the open face of nature. In many of our schools we cannot expect yet to have this work done as it should be. The idea is the training of the habit of accurate observation of all the objects and phenomena of nature around the children's homes and on their way to and from school. There is no time lost, for the use of the eye only serves to make the way less monotonous than it otherwise would be. The pupil observes the roadside where the soil, gravel or rock is exposed. He sees the operations which made the world what it is to-day, developing on a small scale. He can trace the pebbles in the drift to their source, and study the action of frost, rain and flood. He can make an acquaintance

with the different minerals carried to his locality by the true fairy forces of the world while playing himself to school,—with the flowers by the roadside and the insects which prowl or prey around them,—with the romance of the woodland folks, from the burrowing mole to the skipping squirrel, from the light winged warbler to the soaring hawk.

The farmer's son can in this pleasant way acquire more of the fundamental science underlying successful farm work while running to and from the country school under a proper teacher, than he could acquire in a year at Guelph if he had been previously simply creeping like a snail for eight years to school with his eyes unopened to the wonders around him. The same course equally prepares him to become interested in mining, in turning any and every natural advantage to some use. It sets him a thinking; and when appropriately connected with oral lessons explanatory of the rise and purpose of our social and civil institutions, it produces in response the sentiment of patriotism which stimulates him to work for the good of his country as well as of himself.

The second step was taken about ten years ago, when in order to create the sentiment in the public school that skilled manual labor was as worthy in its place as the learned professions, every teacher, female as well as male, was required to take a course of woodwork in our Normal School. Some quiet humorous things were said then of our efforts. "Were we going to train our female teachers to be carpenters?" No, we were not teaching trades. But we were training what was at the foundation of all trades—training the muscles of the hand to obey the intellect. When that is done, every trade is three quarters learned. But more, our course of woodwork was as recreating as so much play; and it left behind the power of doing something. It was no simple thing to scribe a board just where the line should be, and a great deal was learned when the saw could be managed to be used so as just to cut to the line and cut nothing else. It was a good thing for the teacher.

But it was also good for the school. To illustrate. I one day came across a school house with an extremely artistic rustic fence. This is how it came about. The trustees thought the school grounds were as good as it ever was in their days, and would do nothing more. The teacher told the boys that she thought they could do something themselves. She told them to go to the woods and get poles of a certain size, and it was done. She took the saw and showed them how to cut the poles, and that was done. She showed them how to set the posts and drove the first nails. The school grounds were cleared and graded. Then, within, shelves were made for books and cases for a library. The boys would have done anything for that teacher, the worst boys having become the most admiring. At last the village began to know and admire the teacher, and the influence of the school reformed the community. The simple belief that the teacher knows something which the boys would like to know—that she had educated hands as well as educated thoughts, increased her influence; while the practical knowledge enabled her to see many things that were wrong and how they should be righted.

The third step was the issuing of plans of rural school houses in which a class room with a workbench was figured, and the appropriate tools were named. Here two or three boys may work during the noon hour under the charge of the steady boy, a different set for each day of the week, if so many want thus to employ their time.

The fourth step was the legislation allowing as much as $600 to be earned by a school section, if a properly equipped manual training room for mechanic or domestic science should be established with a qualified instructor. Just as this was done, Professor Robertson with the Sir William Macdonald fund came along; and with his trained English teachers gave us a superior training school for special teachers for these schools. Under them, the training school in affiliation with our Provincial Normal School at Truro became so evidently the

potential centre of this work in the Maritime Provinces, that it has been made the training centre for the teachers from the three provinces. Our course of study developed there has been substantially adopted in the Macdonald schools in each of the other provinces of the Dominion. So that the sneering of ten years ago has now given way to cheering all along the provinces.

A fifth step was completed when the new science building in affiliation with the Provincial Normal School was completed and fully equipped, last fall. Our teachers graduating from this school in the future will have the advantage of the best fitted up laboratories in the Atlantic provinces of Canada; and the nature teaching will be more likely to develope the industrial trend of sentiment than ever before. The farmer, the miner, the fisher, the gardener, the manufacturer, the trader, and so forth, will see that their vocations can be as learned as those of the old learned professions, that each kind of employment has a science underlying it, the mastery of which by accurate observation and watchful attention may be duly gained. And when this is understood, the pupils have so much more power over the forces of nature. For in fact, all the industries depend for their successful exploitation on the knowledge of the natural sciences underlying them.

This much we have done. We have laid down the lines Manual training schools last year drew some $3000 from the treasury. This year the amount will be double. In another year or two, when all the villages as well as towns have such schools forming a part of the general system, the expenditure must rise to something over $10,000. The more elementary work is being done, and there will be hundreds of young people trained to use their hands as well as their minds, who will begin to call for technical instruction of one kind or other. When such a school is established it is likely to be filled at once, for we have begun below. And as the government has given us the general and elementary preparation for technical training,

it may be taken for granted that it is contemplated to complete the system.

But this is the most difficult part of all. We have seen many technical institutions arise in an expensive manner when we consider the extent to which they were utilized for the first years of their existence. As the expense is great, the importance of taking a right step at the first is most important. Better a thousand times cautious delay, than a rushing into what may prove to be unwise action.

Several solutions have been suggested. There is first the scheme of making another step in advance by aiding existing colleges to do elementary technical work of the kinds which may fall most economically into line with their respective equipments, completing the system by a central institution which should be capable of doing the highest kinds of expert work in all the leading industries.

Some may consider that different technical schools should be erected in different parts of the province; agriculture here, mining there, engineering yonder—erected *de novo*. This would be adding to our already too numerous small colleges, and would necessitate the appointment of professors which we already have without enough work to do—a duplication of laboratories as well as of professors in some cases.

Then there is the idea of a single great polytechnic, in which all the schools would be at one centre, where the professors could specialize, and where there would be no unnecessary reduplication of professors.

Some are so fearless of expense that they would establish such an institution entirely new, while others would utilize the arts and science faculties of the strongest university which exists in the province by the affiliation of technical professors and faculties to it. The difficulties in the way are not solely constructive ones. Were that all, the problem could be easily solved, granting that the revenues of the province promise to be sufficient.

The logical sequence of all that we have for the last few years been introducing, is a complete system of technical education. That is plain. Every one can see it is the consummation planned for. But the magnitude of the expense involved is such, that the course recommended in the resolution appears to me to be a safe, if not the only safe course.

That course is to ask the government to appoint a commission to investigate the subject of the completion of our system with a view, first of discovering what department of technical education should be first established, to what extent they should be co-operative with each other or with existing institutions, and lastly to make an estimate of the general if not detailed character of the institutions, the cost of establishment and of effective maintenance. Such a commission should have on it the ablest practical business men of the province; independent men, who are known to have sound judgment in matters of education, of industry and of public affairs; men who give evidence of understanding what is for the public good in the long run, and who will be influenced by no other considerations; or, better still, the most highly recognized authorities or experts obtainable from abroad.

D. W. ROBB moved a vote of thanks to Dr. MacKay for his excellent and valuable remarks on the subject of technical education, which was seconded by A. MCNEIL, and passed unanimously.

Some of the Pyrites Deposits at Port au Port, Newfoundland.

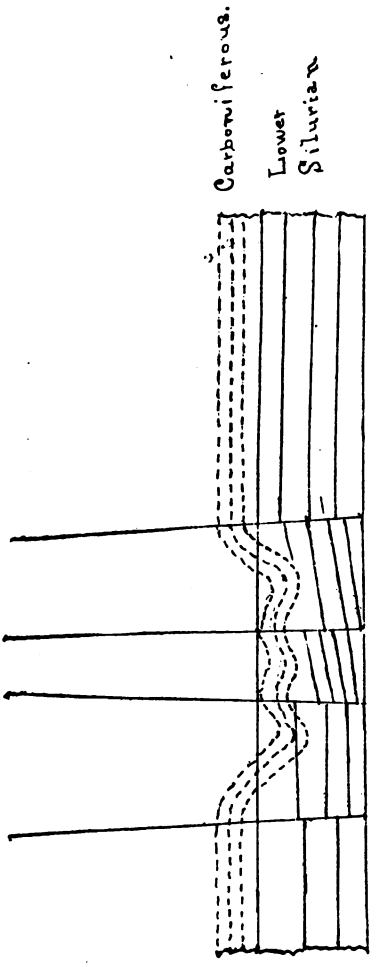
By C. A. MEISSNER, M.E.

(Read February 26th, 1902.)

The subject presents an exceedingly interesting phase of a mineral formation that happened to come under the writer's notice, and which occurs on the western coast of Newfoundland, along the southern shores of Port au Port Bay. That whole section is one of great interest, especially to the geologist and mineralogist, presenting a wealth of fossil and mineral forms seldom seen in any one location. Many of these are in a peculiarly interesting form, giving a collector and student some rare finds, in addition to the economic interest they excite, and it is to this former phase of this section that I want to call your attention to-day. I have brought with me some specimens to illustrate the paper, and only regret that time did not permit my bringing others that I have, bearing on the case.

Port au Port Bay is a beautiful sheet of water, like a great amphitheatre, just north of St. George's Bay, and cut off from the latter by a very peculiar, low, narrow strip of sand called the "Gravels." The southern and western shores, as well as a large part of the eastern, are formed by a large deposit of Lower Silurian or calciferous limestone, resembling in many features the Trenton formation of New York, as described by John Fulton. The stratification is nearly horizontal, with a slight dip to the northeast. It covers an area of many miles east and west, and also to the north, where it finally has been disturbed by heavy eruptions of diorite and magnesian rocks, principally dunite, carrying chrome. These outflows of eruptive matter have caused great disturbances to the limestone formation near the contact, and apparently have caused a gradual sinking towards the center of the bay.

Throughout these limestones, large faults and splits are to be found, at right angles to the stratification, which occur along



Section showing character of Faults at Port-au-Port, Newfoundland.

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the whole water front of Port au Port Bay. The whole country was evidently submerged for a long period after these disturbances, and these faults and splits have in many cases been partially or completely filled in with calcareous shales. (See section, p. 56). These shales have been surmounted by boulder clay, leda clay, and again covered by boulder clay, and subsequently have been brought to the surface by the slow, general uprising of the whole country, while the greater portion of the over-lying, softer carboniferous strata has been denuded by glacial and other causes of denudation. It is in these shales, especially near the point of contact, that we find the pyrites, galena and other mineral matter, either in masses or scattered through the rock, but generally running in the line of dislocation, as stated by Murray. The pyrites formation in these shales represents some exceedingly interesting phases. The first to attract my attention was a large deposit of gossan, having all the appearance of a bed of iron ore. Running through it was a skeleton work of pyrites, which plainly showed that oxidation had not yet been completed, and that some more centuries had to pass ere this bed was ready for its final resting place and its ultimate form.

This gossan showed the following analysis:

	Per cent.
Sulphur	1.25
Iron	53 06
Silica	3.78
Phosphorus	0.003
Lime	Trace.
Magnesia	Trace.
Alumina	20.00
Loss	18.00

The analysis of the solid pyrites was:

	Per cent.
Sulphur	50.04
Iron	44.26
Silica	2.04
Arsenic	None.
Copper	None.

Here, therefore, was the visible, tangible method of ore formation in one of its phases plainly depicted to us. The process, in short, is as follows: The metals are all contained in the original magma or mass, as it exists under the earth's crust, being distributed in varying percentages, iron and sulphur having a very wide and general range of distribution.

When an outflow of igneous rock takes place, it is accompanied and followed by a flow of hot water, steam or superheated gases. These have a strong solvent action, especially when in the condition of very high temperature and frequently enormous pressure, both of which increase the solvent action tremendously. They dissolved or absorbed, among other elements, the sulphur, the acidulated water or fumes in turn dissolved, or combined with, the minerals for which they had the greatest affinity under the existing circumstances, and then spread themselves over the near surrounding regions, dissolving out parts of the wall and contact rock, and replacing by precipitation portions of their solution. The solutions containing the sulphides of iron, are readily precipitated from carbonated waters or gas and by organic or carbonaceous matter; we have, therefore, the acidulated water coming in contact with these calcareous shales containing animal and vegetable remains, which directly tended to precipitate the sulphide of iron, and also had these solutions dissolving portions of limestone and being precipitated in place of the dissolved carbonates, a process which at Port au Port apparently goes on to-day.

Where the conditions are favorable, the precipitation takes place in large masses, and where unfavorable, precipitation would take place in thin seams, or the solution would force itself through the interstices of the rock, precipitating its contents through the whole mass, by replacement. All these forms are plainly visible in the Port au Port deposits.

After the pyrites had precipitated itself into the larger masses, surface oxidation began to take place, the sulphur was oxidized by the action of air into a sulphate, water percolating

through it dissolved it and carried it off, leaving the oxide of iron in its place to form the gossan.

If the process is perfect, but little sulphur remains; if imperfect, we have a skeleton of pyrites running all through, and protected by the oxides of iron from the action of the air, which makes its final dissolution a slow process, unless hastened by erosive or compressive action. At Port au Port we still have the ore in its primary condition in the gossan.

Not a hundred yards away we find the rock impregnated throughout with specks of pyrites. At several points the solvent action has concentrated itself, and in attacking the surrounding rock in force has formed large bodies of solid pyrites, free from impurities in the center of the masses, and gradually grading off into beautiful crystallizations of pyrites and calcite, though the calcite predominates, and finally becomes the solid limestone rock. This crystallization is especially interesting, as indicating the continuation of solvent action at present time, for in the solid rock we do not find the calcite crystals, showing that there is a strong solvent action going on, which first dissolves the lime, recrystallizes it, then gradually replaces the crystals by pyrites, which are added to constantly, until the whole mass is made solid by the pyrites crystals precipitating themselves over each other into one mass.

The material for this accretion in masses, evidently comes from the impregnated pyrites in the main body of the limestone, and my reason for believing them to be of recent origin and in a still formative state, lies in the fact that the gossans are always found at a higher level, thus representing the long-finished process, while the pure pyrites lie at lower levels, where they are subjected to the draining action of the surface waters passing from and over decomposed vegetable matter and then percolating through the mass.

Another exceedingly interesting step in the formation of the minerals is the deposition of what looks like free sulphur, but it is probably a hydrated ferri-sulphate. This occurs in a

higher level than the gossan, and apparently comes from a mass of similar gossan a short distance from land, along the surface of the cliff, and resulting from percolation through the carboniferous shales, which here are heavily brecciated and crushed. All along the side of the cliff we find an incrustation of sulphate on a matrix of ferruginous matter. This was, evidently a solution of portions of the skeleton of pyrites left in the gossan still going on, which when it reaches the cliff as a sulphate in a sulphuric acid solution, was again oxidized, the oxide of iron precipitated from it, the sulphate formed in a more or less impure form and deposited in these minute crystallizations on the surface; these again were partially oxidized, redissolved, and trickled down the cliff. This process, possibly, is similar to that from which the concretionary pyrites were precipitated.

G. W. STUART moved a vote of thanks to Mr. Meissner for his excellent paper, which was seconded by D. W. ROBB, and passed unanimously.

The Aim and Scope of the Mining Society of Nova Scotia.

By ALEX. McNEIL.

(Read February 26th, 1902.)

Nova Scotia is just entering upon a period of expansion, particularly as regards mining. We are the interested observers of this dawn of an era of industrial activity.

We have just seen the coal from Cape Breton tested in several of the countries of Europe with such success that we may confidently regard this as the beginning of a transatlantic export trade in coal. The recent developments in iron and steel have been such as to attract the attention of two continents, and to draw from a high authority the statement that Nova Scotia would soon be able to produce steel ships cheaper than any other country in the world. Signs are not wanting either that our gold mining will assume a new and much more important and permanent position than hitherto, while the enterprise at Cape D'Or is being carried on with a determination and confidence that seem destined to give us a place as copper producers.

Is it not opportune, therefore, is it not indeed necessary, that we, as the society representing these interests, should pause for a moment to consider what part we are to take in this great work, what are our immediate duties and obligations in the premises ?

In order that we may better understand this, let us examine our history and constitution.

In a few days the Mining Society of Nova Scotia will be ten years old. Its progenitors were the Coal Owners' Association of Cape Breton and Pictou Counties, and the Gold Miners' Association. It was born in troubled times. "From adversity in the grasp of imposition sprang this society into being," are the words of its first president.

The platform upon which the society was originally based is a broad one In the words of the constitution, "The object

of the society shall be to mutually benefit and protect its members by facilitating the interchange of ideas, and by taking concerted action upon all matters affecting or relating to the mining industries of the province of Nova Scotia, and generally to promote the said industries by all lawful and honorable means."

With such a policy, it is plain that our first duty is to see that the society be truly representative of the interests it undertakes to safeguard and promote. In the new and changing conditions come new men, whose advent to this society should be not merely welcomed, but accelerated. There is perhaps no object of this society so important or so urgent as this at the present time.

It would be presumptuous to attempt to define in detail the various duties of the Mining Society. But there are certain general principles which it may be well to have understood. Perhaps we can all agree that this society is now called upon to enter a field of action rather than one of mere academic discussion. In order that it may do the work it is now called upon to do, it is necessary that this society become an active working organization. For this purpose the executive of this society might profitably be called together at least once a month.

Having conceded so much, we must now examine some of the work to be done and the best methods of doing it. Whatever the work, it is clear that the society will at all times be brought in close touch with the government. What relations then should exist between the society and the government? Undoubtedly only those of mutual sympathy and confidence and cordial co-operation. In this connection, it is a pleasure to refer to the recent meeting of the representatives of this society with the present Commissioner of Works and Mines, as illustrating the satisfactory conditions at present existing.

In general, the aim of the Mining Society is to benefit the mining industry and those engaged in it. Its scope is the measure of all things that will so benefit. How may we mutually

benefit "by facilitating the interchange of ideas," as it is put in our constitution? Are there practical ways in which we can do this other than by our meetings? Yes, we can develop the Scientific Library and Museum as a means for the transfer of the best technical knowledge to our members at their work. We can also, and it seems right and within our duties, that we should see that the world be supplied with correct information periodically as to the progress of mining work in this province. The best method of doing this should be left to the executive to decide.

But the aim of our society at the present time is thus expressed in its defined object, "to benefit . . . . by taking concerted action upon all matters affecting or relating to the mining industry."

This implies upon our part, perfect organization and close and intimate knowledge of the industry, for without these our work would be always ineffectual and often harmful. It is unnecessary to enumerate here the questions that this society is now considering and urging upon the attention of the government. It is our purpose to-day to view the frame-work rather than the particular parts of our structure. One of the greatest problems with which the mining industry has to deal in all parts of the world is the settlement of the questions that so often arise between capital and labor. Happily, we in Nova Scotia have been favored in this respect. But this society should prepare the way for helping to adjust any difficulty that may arise in the future.

There is another question that is to-day interesting the whole of Canada, and it has especial concern for the mining industry of Nova Scotia. That is the question of transportation. As regards coal, there are the questions of car equipment and a reasonable railway freight tariff. The coal tariff of the Intercolonial Railway, and still more of the highly subsidized company roads in this province, is much higher than the rates charged on railways in the United States, and to that extent

hampers our coal trade, especially in competition. As regards gold mines we have the important question of highways. Certain gold mining districts in this province have the undesirable distinction of possessing, as a means of reaching them, the worst roads to be found in the country.

These are matters that greatly influence for good or ill, our mining industry. These require active organization to remedy, Other matters of equal importance might be mentioned, but perhaps enough has been said to indicate the lines upon which our work should be drawn. And from whatever standpoint we view it,—whether we consider the immensity of the interests involved; whether we regard the question patriotically, as one that deeply concerns the future of this province; whether we look upon it as a means of progress for a people eminently fitted to have and hold a foremost place in the world's civilization,—there is enough to incite the ambition, to arouse the zeal and stimulate the action of each and all of us. The cause itself, and the effect sought, call, in the words of our constitution, for "united action." In union there is strength, without it, nothing. So also does our constitution demand that all our work shall proceed by "honorable means." Our members are engaged in a noble calling. Let us be jealous of their reputation. Animated by these sentiments, and profoundly anxious to facilitate the progress of the industry, we may hope to do our part in that growth, which has already begun, that will yet make Nova Scotia the Great Britain of the world's coal trade, restore to her in a new and enlarged form the great shipbuilding industry, and give to our province that position in the world's trade and commerce that her natural resources, the character of her people and her maritime position, fitted her by every provision of Nature and Providence to acquire.

G. W. STUART moved a vote of thanks to Mr. McNeil for his excellent paper, which was seconded by D. W. ROBB, and passed unanimously.

Some Aspects of Technical Education.

By Prof. J. E. Woodman, D. Sc.,
Dalhousie School of Mining and Metallurgy.

(Read 8th October, 1902).

The subject under consideration is so wide as to require specific limitation in the field discussed, especially in so short a paper as this must be; and for the same reason no one standpoint can be elaborated and defended here, but can be merely stated in brief. My objects, therefore, are two: to set forth in barest outline some results of observations, my own and others, embodied in the last cases in the curricula of some of the best technical schools; and to stimulate discussion and further observation. In accordance with these ends the viewpoints chosen are three, related to engineering, and in part especially to mining.

Secondary School Preparation.

The young men who enter technical schools, or who choose the engineering courses in universities, are usually of a class intending to practice an engineering profession. Rarely applied science is adopted as a prelude to law or to business; but such cases are sporadic, and both the college course and its required precursor must be adapted to the many whose gain is to be direct rather than indirect. It is noticeable that while matriculants at scientific schools are sometimes younger in age and at first more boyish in demeanor than those at the ordinary university or college, they soon develop into a markedly steady and earnest corps, if, indeed, they do not show these qualities from the beginning. All may not agree with me, but I feel free to state that in my own short experience, covering, however, a teaching contact with some four thousand young men enrolled in scientific or arts departments, the former have often shown themselves more earnest in their work, more interested in their courses, and less anxious for marks as an aim and end, than their fellows. They are, in many cases, limited in financial means,

and under the necessity of entering the arena of open competition as early as possible. What shall be our requirement of their matriculation, and what of their professional training, as compared with those of their brothers in the college courses of ordinary type?

Much of the attitude upon this subject in various schools depends upon the history of their origin and growth. Wherever there exists a scientific collegiate department, begun with the idea uppermost of affording relief for suffering Latin and Greek victims by absolving them from examination on these topics; or, by offering an easier series of entrance requirements, of catching up a class of "special" students who cannot quite reach the regular college standard, there you will find the members looked down upon by the regular college men, and doing work of a poorer grade than should be allowed in the institutions authorized to grant degrees.

On the other hand, a few schools place their requirements for admission so high as to occupy an anomalous position, intermediate between a college and a graduate school. If, as some of our best educators claim, professional schools should be of graduate grade, the question will be decided by experience and discussion. In the meantime they should be at least either distinctly graduate or on a level with the college itself. It is becoming the custom to revise the entrance requirements frequently; but if you will watch the change made in any well balanced institution, you cannot fail to be struck with the fact that these revisions never lower the standard and rarely raise it, but are rather in the line of offering greater opportunities to youths possessing diversities of taste and natural aptitude. In other words we are coming rapidly to recognize that the bachelor's degree should mean a certain average stage of mental development; that to attain this, studies of very diverse natures, but sufficient to occupy about four school years, can be made conveniently to operate, and that to undertake these studies

safely the pupil should have attained a given mental capacity, and have reached a certain psychological stage.

We feel also that beyond certain fundamental truths, the knowledge of which is essential as a basis for life in comfort and safety with one's fellows, different children need somewhat different studies and treatment, in order to bring them to the stage where they can well undertake college work or diverge on other lines. The power of mental stimulation and development is no longer regarded as the exclusive possession of a few favored studies, but many may contribute to this end. This does not mean, mark you, that unlimited freedom of selection, which is the extreme of the elective system, should be allowed to pupils of secondary schools; but it does mean that each pupil's needs should be considered, and to some extent his tastes, in so ordering his studies as to secure a symmetrical development of mind.

This being granted, it appears as though it were wiser to require of matriculants in engineering of all branches, no higher development than of ordinary college freshmen, and certainly no lower; but to offer them such options in entrance subjects as will, without altering the standard, suit tastes that in many instances have already been formed wholly or vaguely. The candidate would do well, however, to be strongly equipped in mathematics, physics, and if possible, chemistry.

There is one line of studies introduced now many years ago, and coming more into favor each year, which deserves separate mention. Manual training has many supporters and many foes. In places where it is properly taught, by instructors who have breadth of mind and sympathy as well as acuteness of touch and eye, it is well received by teachers of engineering subjects. Some of the technical schools and universities even resort to manual training high schools to give to such of their pupils as most need it practice in handicraft. I believe the experience of many others would agree with my own, that graduates of a good school of this character have a distinct advantage in such work as requires the skilful use of the hand and eye, especially on

machinery. Moreover, most of those with whom I have dealt have been able to anticipate directly some of the essential work of the first year of college, particularly in ordinary mechanical and machine drawing. The advantage of this anticipation is very great, in a course which must of necessity crowd into four years an increasingly large amount of work.

The Curriculum of Technical Schools.

Regarding the curriculum of technical schools, there is opportunity here for only a few considerations of this large problem as applied to mining schools. The basal fact is the necessity for a thorough groundwork to the various engineering branches, so similar as to be nearly alike for all. This is the experience of the best institutions. All the undergraduates need a strong series of mathametical studies, taking the students through calculus, a practical and somewhat advanced knowledge of physics and the elements of chemistry, and the ability to use drawing instruments in mapping and the delineation of simple machinery. Upon this as a foundation each engineering science builds a special superstructure. For mining this includes more physics and chemistry, applied mechanics and allied structural studies, and the principles of machine construction. In addition there are required courses in elementary and economic geology and mineralogy, general mining, assaying and metallurgy; and special courses discussing in as great detail as possible the best methods of treatment of economic materials peculiar to the region which the influence of the school covers, the intimate chemical and mechanical natures of these products and their uses, present and possible.

The last named courses make or mar the efficiency of a mining school; and no such institution is doing its duty to its constituency which does not strive to the utmost to adapt itself thus to its environment; and I may add that its constituency will be doing its highest duty only when it makes this far-reaching usefulness possible. The colleges which so train men that they use local conditions to the best advantage can place

their graduates at good incomes for hard work. Such is the Colorado School of Mines. Here is where some eastern mining schools fail of the highest efficiency. Their distance from centres of economic activity makes it necessary to go far for their practical instruction in mining operations and mining geology, at considerable expense to both institution and students. The inevitable result is the accentuation of theoretical and text book instruction, and a lack of first-hand acquaintance with field conditions. In opportunities for practical study, a school of mines in Nova Scotia, centrally located as Dalhousie University is, has a wonderful natural advantage; and Dalhousie University proposes to take advantage of it.

It may be that this paper is expected to contain some declaration of a more definite nature than heretofore, regarding the ultimate aims of the new Dalhousie School of Mines in the training which it proposes to give its students. This is easy to do in the rough, impossible as yet in the smaller details. One point can be made positively. The school starts out with no visionary theories, to be worked out at all hazards, but is in existence to serve the province of Nova Scotia, and as much wider field as may be influenced by it, in the best manner and to the greatest extent that the ingenuity and devotion of its corps and the loyalty and generosity of its friends make possible. All those subjects which by the practice of the best schools appear essential to a general mining training, will be taught with the greatest thoroughness. Beyond this the institution proposes to specialize along such lines as will on the one hand meet the greatest present demands for trained men, and on the other will open up new and promising economic possibilities in the province.

Thus, in metallurgy, we hope ultimately to go far toward solving the problem of how best to save the waste gold in our somewhat elusive ores; to study the peculiarities, mechanical and chemical, of the various coals, that we may discover to exactly what uses they can best be put, and what treatment each should receive

to make it most effective for its purpose. We hope to develop study in the new science, metallography, which shall make possible the greatest gains in the use of Canadian steel and iron. In all lines the ideal toward which we shall strive, is to make research and instruction go hand in hand—to keep the teaching up to the highest point of efficiency in every way, to incorporate in it everything new which is of worth, to stimulate such research as shall constantly widen the usefulness of the economic minerals of a metallic or non-metallic nature. It should be possible, when the scheme is completed, to give any grade of instruction required, stopping at any point, and on the other hand, carried on, if desired, to as near completeness as the state of knowledge at the time will permit. It must be possible, also, for close specialization to be available to any student in either mining or metallurgy. In the former, one may prepare for work in coal, another in gold, and a third in iron. In the latter, some may deal chiefly with one ore; some, with another. For the time is already here when it is not enough to be a mining expert. The successful man must take up one line of study within this general field and make it his own. Two more subjects will receive attention. It is proposed to give each student so thorough a training in the use of his own language that he shall be able to write with clearness, brevity and force; in other words, to present observations accurately made, in a good English style. This is much neglected in some quarters. The second subject is one that is strangely absent from the program of most mining schools, while well developed for civil and other branches of engineering. It is planned to give to each undergraduate, especially in mining proper, an elementary knowledge of mining law; and to both mining and metallurgical students, training in the drawing up of contracts and specifications applicable to their line of work.

The use and abuse of equipment is a topic which naturally belongs here, allied as it is to the proper utilization of the environment. The advice has often been given by the dean of

one of the foremost technical schools in America, to "teach as little mining in college as possible." Inasmuch as he has graduated men who are in the front rank of experts in their respective lines, while he had, in the poorer days of his institution, little direct economic instruction in its curriculum, the statement has weight. Its meaning is, that the student's time, all too short at best, should not be spent in study of the intricate details of machinery and methods which are certain to be obsolete to-morrow; but that rather it should be employed in mastering thoroughly the general principles of the machinery, or metallurgical or mining methods, and the student started on his practical career so well equipped in this way, that various makes and styles and processes will be easily learned. Many a graduate, from eastern schools especially, has precious knowledge to unlearn when he reaches the mines or the shops. After all, four or five years of undergraduate study cannot be expected to fit one to command at once; but he should be fitted to serve so intelligent an apprenticeship that he soon outdistances his less trained competitors in usefulness to his employers and to his profession.

The possibility of five years of study has been mentioned. We are on the horns of a dilemma, represented on one side by an ever-increasing competition in the struggle for existence, and consequent necessity for entering the fighting ranks early; and on the other, by the rapidly deepening specialization in this, as in other branches of knowledge, and the need for further and further study with each class of students before proper equipment for competitive work has been gained. The best solution suggested thus far, and the one adopted by many schools, is that of urging anticipation of some studies before matriculating, giving opportunity for summer work, and encouraging all who can afford the time and expense to remain for a fifth year of study. It is well recognized, I think, that from a financial standpoint, such long specialization pays in the end.

The Attitude of the Graduate and the Community.

There is a most insidious danger to all technical schools,—the spirit of commercialism. It is painfully apparent in some institutions that the atmosphere is surcharged with the germs of this disease, infecting all lines of applied science. Teachers and students alike constantly, either directly or by implication, are asking the question, "What money is there in it?" Men are in business, as proprietors or as engineering experts, to make money. But it is one thing to look so short a distance ahead as to work for the greatest production in a short period, another to plan wisely for that development of the project which will in the end produce most with the greatest fairness to all concerned. This commercial spirit is to be prevented in part by the strength of courses in pure science, and by keeping the purely monetary aspect out of even technical studies, the students being trained to do the best which their knowledge and inventiveness will allow, irrespective, as far as possible, of pay or immediate financial prospect. But the danger is to be avoided even more by the whole attitude of the teaching corps—an attitude of openmindedness toward everything that is good in their professions, and of unwearied opposition toward the use of shortsighted or underhand methods for ever so great a proximate gain.

There is possible also, even imminent, the danger that the graduates of a school will go out with a "holier than thou" attitude toward the practical workers in their chosen field, a superiority born of books and inexperience, a desire to be master or superintendent, but a repugnance to take off their coats and soil their hands. Our new school is firmly resolved not to be wrecked upon this rock; and its officers will count themselves under great obligation if any of you who may later be employers of its graduates, or may allow its undergraduates the privilege of summer work with you, will take every opportunity to discourage the state of mind outlined above.

At the same time we shall strive to give our men such training, and to secure for them such opportunities of practical experience, that they shall graduate with a disposition to be of greatest service wherever they may be engaged in work.

And this brings me to the attitude of the community which gives its youth into the care of the school for training, and which in its turn should be fed and faithfully served by its graduates. Here again there is time only to consider the personal phase presented by local conditions. Dalhousie University has begun a struggle to give to the province a mining school worthy of its great natural resources and the high native ability of its youth; and in the early stages of this struggle it has received most enthusiastic and far-reaching support, not only from alumni but from business and professional men throughout the province and from others who could hardly hope to be benefitted in any degree by the school. It has seemed like a great revival of altruism.

In this support your society, and its members individually, have borne a large and honorable share; and Dalhousie is profoundly grateful to you and to all others who have given encouragement, sympathy and financial aid. But this is only the beginning, always a time when enthusiasm runs highest. There are coming months and years of slow development and growth on the part of the school, and of waiting on the part of its friends, sometimes it may be without apparent advance. You, who are either experts or captains in the mining industries, can better than others appreciate these conditions. And we ask from you continued interest and sympathy, and a patience born of first-hand knowledge.

There are many other ways in which the school must look to you for help, and it will do this with confidence. The ideal which has been sketched in so rough an outline will take time and devotion to realize on the part of the teachers, and constant aid on the part of its supporters. The first may be taken for granted, for the men are full of zeal and persistence. But we

want places for our graduates when they begin to go out, and you control them. We ask no favors for incompetence, but a fair chance to the young men to do their best for you. Moreover, it will benefit the undergraduates beyond measure to have opportunities for summer work, at whatever wage they may be worth, over or under-ground, or wherever they may be useful. You can help us in this also. One of the ways in which eastern mining schools fail most is in lack of opportunity for this and for seeing often methods of operation in well conducted plants. We shall ask for permission to visit works and mines, to make surveys and drawings and structural studies. We want our students to become accustomed, as, indeed, some already are, to see and experience the handling of men, and the being under others as well. That is, we want to develop the power of intelligent service and leadership.

Finally, we may ask for that class of aid sometimes called substantial. If any have by accident escaped thus far, they have only to remember that our ideal will require money, equipment, engines, laboratories and instructors, to realize how dependent we are for the means with which to get these. Many of you might hope for ultimate gain in one or another line of business from the success of this school. Yet it is not to this spirit that we appeal, but to the spirit of altruism, generosity and provincial loyalty which the men of this country have time and again shown in a high degree.

Discussion.

H. S. Poole.—I would be very glad indeed to speak on the subject if I felt at home in it, but having been much absent lately, I have not had an opportunity of meeting Dr. Woodman and of learning of the steps being taken with respect to the new school of mines. I recognize that there are great difficulties ahead, and that time is an element that will count in the establishment of the school as desired In obtaining the confidence of our working miners to induce them to become students,

it will be necessary to provide the knowledge they desire and will be glad to benefit by, when it is also shown that the apparatus and equipment of the college will meet with their special wants. Hitherto, any of our students who have taken up the subject of mining in any of its branches, have had to go to western Canada—and some have supplemented that by actual work underground in mines in Nova Scotia or Ontario. The broad résumé that Dr. Woodman has furnished us with, has been of great interest to me, but I can only look upon myself at present as an outsider in the matter, yet as one pleased to know what we may anticipate and expect from this school that is being established in Nova Scotia.

HON. R. DRUMMOND.—I can only emphasize what has already been stated. I have no hesitation in saying that it has been a very excellent paper. One point that struck me favorably was that the students are to be well trained in English. I happened to have had an argument with a leader of a manual training school the other day. He asked me what good could spelling do a man. I reflected that if that was the thought of the principal advocate of manual training, then manual training was a fad. I could have pointed out to him a man of good ability who had lost his chance to be manager of a colliery because he was not able to spell his words correctly, but who otherwise was a good man. I thought at the time, that if manual training discouraged elementary education, then it would be better that manual training should go, and that we should stick more to our common school education. I think we should always have in mind that we ought to give a sound English education first, and other things could come afterwards. It has been said that it will be the aim of the college to give the students a good English education.

Can you give me, Mr. President, in a few sentences, exactly what we want with respect to technical education, as far as mining education is concerned? I think we should be frank here, and that I have a right to ask this society exactly what it wants in reference to technical education. As far as I am con-

cerned, my interest is more with the view of getting our miners into a college. We cannot afford to send them five years to a college, and they cannot afford to go. I think this society might found a scholarship—in fact, I would go further, and say that each coal company should give a scholarship to the miners of this country. Each company might be induced to pay a sum which would cover the expenses, say for one term, of one who had passed a good examination before our provincial examiners' board. I do not see why this society could not establish such a scholarship. The members of the society are not perhaps aware of the extent of the rigid examination which our candidates in our miners' school have to undergo. Mr. Poole will tell you that the subjects of examination are pretty difficult. An instructor taken from among the miners has to know almost everything. Dr. Woodman's remarks, as I understood them, were to the effect that they were not going to put out a class who knew everything. That is well. Take the captains of industry in our largest concerns—take, for instance, Mr. Shields, of the Dominion Coal Company; is it necessary that he should know geology and chemistry? No; for this reason, he is to lead. If he wants a chemist, he gets one. I know a man, who is not very far away now, who has been a successful manager of a colliery, who knows a good deal about chemistry, but I would not depend upon his analysis. Instead of putting out "jacks of all trades," they should put out men who have a special knowledge of some particular subject and a general knowledge of science. It is not to be expected that a captain of industry knows all these things. If he should be familiar with one of these subjects, there may be men under him who know it better. I do not know that I am expressing orthodox views, as this is the first time I have had the pleasure of addressing you. I was glad to learn from Dr. Woodman's papers that they are going to put out men trained especially in one branch.

W. L. LIBBEY.—I have a few ideas as to what, as an individual member of this society, I would like to see in the line

of technical education, and an expression of those ideas may be in some degree an answer to the Hon. Mr. Drummond's questions.

As a manager of a gold mine I would like to be able to employ men with technical education in lines outside of my own knowledge. We need in gold mining, men who can do surveying and engineering and who are versed in various metallurgical processes. Most mine managers have enough of business in general to keep them occupied so fully as to render it impossible to devote attention to detailed specialties, even if qualified technically. In many cases it is financially impossible to employ an expert with ripe experience, and resort is had to young men just starting in active life, whose principal qualification, in many cases, is a degree from a mining school or college. It is almost always the case that these young men have had no practical experience as miners, and frequently they know nothing whatever of manual labor in any form. Too often, also, these same young men have, probably unconsciously, acquired an intolerance for the knowledge of the practical miner which often amounts to contempt. Now in no case would the ability to handle a gang of men, or to know what a fair day's work is, be a disadvantage to them. In many cases it is an absolute necessity to the metallurgist or engineer of a mine.

Now we have in Nova Scotia hundreds of young men in our mines who have, from necessity, been at work while others have been in schools and colleges. They have already the practical experience and are equipped to absorb and apply technical education in vastly less time than the perfunctory student. I might mention that during this summer I had no less than five applications from students of various institutions for a position where practical experience could be obtained. In each case I offered a chance to begin with real mining work, and subject to the conditions as to hours, etc., applicable to any other miner. Only one accepted, and he held on about ten days and then left. Now mining engineers are not the cause of miners, nor are miners the results of their efforts,—the reverse

is more nearly true. The larger portion of the income of this province is derived directly from our mines. Our miners cannot afford to take a four or five years' course in a university, therefore let some system of short and efficient courses of instruction be devised for our miners, and if government aid is to be given to a mining branch of education, make it a condition that every student availing himself of the privileges shall get enough of bone-and-muscle labor in mines to enable him to intelligently supervise labor.

I am pleased to hear Dr. Woodman declare the determination of Dalhousie College to turn out graduates who will not be sluggards and theorists solely, but practical men who will be of use to themselves and their province. The able address of Dr. Woodman has made my always kindly feelings for Dalhousie College more pronounced.

A. McNEIL.—I have taken a great interest in Prof. Woodman's remarks—not merely in the paper itself, but on account of the position he will occupy in the new School of Mining that is being established in connection with Dalhousie. We feel a great deal of interest in this school. I was particularly interested in the remarks of my friend, Hon. Mr. Drummond. His remarks, whether he writes them or speaks them, are always interesting and very much to the point. There were two matters dealt with by him that I would like to refer to. He asked: "Has this society, in a few words, put down what it really wants on this subject?" My answer is, that the society has done so. It has put down in a few words what it wants on that subject, and it has adopted those few words as its policy, and its business is to advocate that policy until it accomplishes its object. Those words are as follows:

"Resolved, that the government be asked to appoint a commission composed of able, independent and impartial men, who shall enquire fully into the subject of technical education and the best primary work as a preparation therefor as now carried

on in other countries, and the method best suited to the needs of Nova Scotia."

Those are the words of this society, and that is its policy. We have asked the government to aid technical education, because there is no other body that can do it so well or even do it at all. As to whether it is necessary, we have discussed that at length. We have in this province a long organized system of public education. We propose, in consequence of the great industrial change that has taken place, and is to take place in the future, to adopt the most modern system of technical education in the province. We say that no change should take place without the greatest care and study beforehand. The best way to make that study is for the government to get the very best men to learn how it has been done in other countries, and then to see what is being done in the province of Nova Scotia, to examine all the local conditions, to see who are the men who really need this training, and how to reach them.

Another point made by Mr. Drummond was, that the German system was always spoken of as being the best that could be adopted. He believed that the success in the German high schools was owing largely to the excellent work in the elementary schools. With these remarks I need not tell you that I am in entire accord. When I had the honor of addressing you first on this subject, when the matter was first brought up, I referred to this fact.* In connection with those remarks, I will read to you a few sentences of what was then said :

" Now in connection with the work to be done, it is thought by some that if we get a high-class technical institution, one in which the highest course of scientific training will be taught, we have done our whole work for the fitting of our young men for taking up the mining business in all its branches. No greater mistake could be found. A great error would be made if this institution were established, and we thought

* See *Journal of Mining Society of N. S.*, vol. vi, p. 62.

we had thereby completed the work. The effectiveness of the German school system is not that in that country they have high-grade schools merely, but is due in large measure to the excellent work done in their elementary schools. This has been pointed out in a paper read recently before one of the associations in England, where this question is receiving the attention of the ablest and most advanced statesmen. In fact, two leaders on opposite sides of politics, Lord Rosebery and Joseph Chamberlain, have suggested the proper work of education along these lines as a remedy for the danger affecting the trade of Great Britain, and they pointed to the work done in Germany and the result in that country as proving their contention. A gentleman who has closely examined the German system, says that most important work is done in the elementary schools, and that it is there that the foundation must be laid"

The School of Mining in connection with Dalhousie I have no doubt will be successful. I have not the slightest doubt that it will do a great work, but it will not by any means accomplish all that is required in the way of technical education, and it will not be even highly successful if we do not press this matter forward and get sound elementary training also.

G. MORROW.—I do not know whether the time is ripe to go very far into this matter. Unfortunately, I was away last winter when the subject was being discussed here, but I understand that it was brought to the government's attention. I believe that it is a right and proper thing in this country where mining is growing so fast, that the government should take up the question of technical education. But this is what I want to bring out. Mr. Drummond has truly said, that what we want is to devise means by which a number of our able men who are at present working in our mines, may get a little education, in order that they may be able to develop into men useful to the country. How can we get them taught at this college? I understand that the School of Mining at Dalhousie is practically a settled thing. Mr. Libbey was perfectly right when he said that a

man to be at the head of a great work is not made, he is born. You can get lots of men to do a particular piece of work; it is only a question of paying for the talent that you require. It is to the interest of the province that the mines should be developed and brought into use in the proper way. The government gets the most of its revenue from the mines.

We propose to educate our own people to carry along the mining development of this country. We feel that it is patriotic on our part to do this. There will be, of course, a certain number of young men in this country who can afford to take a course at this school, but there also must be a lot of men in this country who would like to do so, but cannot afford it. We want the government, as it is the owner of the mines, to assist a certain number of men in this province to go to this school and get the education necessary for them to work intelligently in our mines. A certain number of scholarships should be given, and a competent authority should be established to say who shall get the scholarships.

PROF. WOODMAN.—I am very glad to receive the suggestions that have been made, and I count upon your interest and sympathy in order that the school should best serve the needs of the province.

PRESIDENT STUART.—Some days ago, learning that Prof. G. W. Maynard of New York was present with his son, I invited him to attend this meeting and address us on his impressions of Nova Scotia, and he has kindly consented to attend and give us his views this afternoon. I think we might also profit by having a few words from him this morning on the question of technical education in connection with mining industries, and on some of the technical institutions throughout the world. I believe he was one of the charter members, one of the noble twelve, who first instituted the American Institute of Mining Engineers. I think we might with great profit have a few words from him on this question.

PROF. G. W. MAYNARD.—I wish to say, Mr. President, that I am greatly indebted to you for having asked me to postpone my return to New York so as to be with you to-day, because since I have been in this room I regard what I have heard as a liberal education. I have had quite a long connection with the Polytechnic Institute of Troy, which was the first school of engineering established in the United States, and previous to that with Columbia. Our School of Mines in New York was practically the parent of the Polytechnical School of Mines and of the Polytechnical Institute of Troy, which I had the honor of organizing.

Much reference has been made to Germany and the preliminary training of young men in that country before they start out on their careers. In Germany, the youth are taught to observe very early in life,—that is to say, to study the science of the home or surrounding country. The young children are taken out by their teachers, probably once a week or more, and they are asked simple questions about different things in nature, such as—What is that? A.—That is a tree. Q.—What is that? A.—That is also a tree. Q.—Are they both alike? The child will probably say "yes." Then the teacher will say, let us see if they are both alike? The leaf is examined. Q.—Look at these leaves, are they alike? A.—No, they are different. Then they take up the structure of the bark. Such is the method in the teaching of things that surround us. So many people go through the world with their eyes shut. What kind of a rock is that? Many people would say that it is a piece of "common stone." Why should not a child be taught at the beginning to know the difference between a piece of granite and a piece of limestone. The training of the eye is absolutely necessary. A large amount of knowledge that we retain through life comes through the trained eye.

I took a course of technical training in the German mining schools, and afterwards at the mines of Chemnitz in the Harz Mountains. We had to take a thorough course. The pupils had to go underground and learn to handle the drills at work

roll out the ore or waste rock, and follow that up by holding a drill and also by striking at it. Then we had to go to the smelting works. I started with pushing a cinder buggy, and later took the management of a furnace.

You have heard Dr. Woodman's remarks with respect to the School of Mines at Colorado. That school had quite a struggle at the beginning, but they are now doing capital work. I quite agree with the view you have taken with regard to specialism. It is impossible for any man to cover the whole field in the practical management of a mining or metallurgical enterprise.

I am delighted to hear that you are establishing a school of mines here. You have not far to go to your mines of gold and coal. I am going to say very frankly that I think that not all the mines are conducted in a manner which should be exemplary of mining as it should be carried on. Therefore it is important that you should have trained men—trained in the technical school of mines. They should be taught how to observe and learn. Teach them the grand principles of the particular branch they may take up. I rejoice that this society is taking the step that it is, and I trust that you will not give the government any rest until it has done what it ought to do.

Mines and Mining in Nova Scotia.

By Prof. George W. Maynard,
New York, U. S. A.

(An address delivered October 8th, 1902.)

Your president has asked me to give my views about the mines and mining in Nova Scotia. This is a very presumptuous thing for me to do before this distinguished body, and any views that I may have will certainly be of very little value were it not that I have as a guide the admirable work that has been done by your own geologists and engineers in Nova Scotia. I particularly refer to the work of Mr. Faribault of the Geological Survey, without which it would have been quite impossible, I think, for any of those who come from the United States to have a proper conception of the mode of occurrence of your veins and the general geology of the gold measures.

I must acknowledge with mortification, not only as regards myself, but also as regards other men of my profession, that we have had a very inadequate notion of the mining, and particularly of the gold resources, of Nova Scotia. The general impression, up to within a few years ago, has been, that Nova Scotia was dotted with abandoned mines. I came here a few years ago with that impression.

I have now been coming for several years, and I have ascertained this fact,—that Nova Scotia is not dotted with abandoned mines, but with abandoned prospect holes. I find that there are but few mines in Nova Scotia. I mean by that, few that have been developed to a degree which entitles them to be called "mines." Where work has been carried on to any depth, as it has in several cases, we have ascertained that your veins continue in depth. I have had the privilege of examining some of these mines, and I must say the more I have seen, the more I am impressed with the permanency downward of your quartz veins. They are admirably defined. It has been my good

fortune to see workings that have been carried down to a depth between seven and eight hundred feet in Nova Scotia. When I mentioned this fact at home they said to me, "You are mistaken; there are no mines of such a depth in Nova Scotia," —and my reply was, "If you do not believe it, read these Government Mines Reports"; and furthermore I told them that I know how to read a tape line.

There is everything to encourage one to go on with the work here. It unfortunately happens, however, that the majority of the openings that have been made have produced extraordinary rich ores on the surface, and that they have diminished to a normal value of $8.00 to $10.00, as they have been worked down. Eight- to ten-dollar ore, we consider good ore on our side of the line.

Of course if you always expect to have four- or six-ounce ore, your expectations are unreasonable. I think many of you will bear me out, that much of the work has not been carried on in as intelligent a manner as it ought to have been. I refer more particularly to the milling, to the saving of values. In travelling about the country, I have found great quantities of tailings that contained values. I must say I am surprised that the modern systems of mining concentrates have not been generally adopted; but as far as I know, where they have been, they have been productive of very satisfactory results. For my part, I shall only be too glad to let those with whom I come in contact know that you have values here worthy of attention, mines that are worthy of being worked in a large way; and that if capitalists in New York, Boston, Philadelphia and other cities in the United States, people looking for investment in gold mines, would come so near home as Nova Scotia is, within thirty-six or forty hours of New York city; they would have a pleasant trip in summer and they could see the conditions for themselves. Capital should flow in. Instead of a gold production of $600,000 or $700,000 a year, I do not see why it should not be made many times that amount.

I have been in districts in this province and was amazed at the manner in which shafts have been placed. They are not mines. They are not prospected in the manner they should be. Of course you are well situated with respect to water; and I am more impressed every time I come here, with the cheapness of your fuel, particularly wood. You have also cheapness in labour. There is another fact which I might mention, you are not cursed with labour strikes. Your mining population prefers to live in Nova Scotia. I think that in that particular you are remarkably blessed, for it assists much toward cheap mining.

There is another point which I would like particularly to refer to, and that is this:—it is impossible to go into one of your mines and sample it in the ordinary way. There is only one method of sampling, and that is to do it in a large way. Break down one hundred tons of ore, and if you have not a mill, haul it to a place where there is a mill. That particular policy I have always insisted upon. It is the most absolute folly to go into a mine with a pick, and break samples off here and there to ascertain its value. You are bound to be fooled one way or another.

I will relate a case of a mine carrying free gold in Sonora, Mexico. I had a carte blanche order to test the mine. I broke down something like one thousand tons of ore. Now, I shall relate a very interesting fact. I do not know that I discovered it, but I did so far as that particular mine was concerned. Fortunately, we had a Blake crusher, and were able to crush the material to thirty- or forty-mesh. For each sample lot I took fifty tons, and finally cut it down to a few hundred pounds, and quartered it in the ordinary way. My samples from each quarter were taken to New York, and crushed down to the necessary fineness, and yet in no two cases did the results concur. Now, this shows that one is liable to be led astray, even when such precautions are taken. The milling test of free-gold ore is the only way to get at its values.

Capital too often is not willing to pay money for the purpose of finding out the value of a property, but will be willing to put money into an expensive plant, and then you know, as the majority of us do, that before long we have to make a post mortem examination.

DISCUSSION.

W. L. LIBBEY.—We all appreciate the fact that Professor Maynard has had a chance to inspect our mines at seven hundred or eight hundred feet, and I am sure that we are all glad that he has come here and given us his impressions. I think he has even been down nine hundred feet.

PROF. MAYNARD.—There is a mine in Nova Scotia, known as the Brookfield Mine, and it is one of the best mines I have seen in this country. It is one of the mines where the accounts have been classified out to the third place of decimals. Mr. Libbey, the manager, can tell you how much a candle costs to one ton of ore mined. That is an example of good mining accounts, a thing that is so lamentably disregarded. Too often we pay bills to the 31st of December; if we have anything over, that is our profit; if we have not anything over, it is not mentioned.

HON. S. H. HOLMES.—We are fortunate in thus having presented to us the impressions of Prof. Maynard. I beg to move a vote of thanks to him for his admirable address.

J. A. JOHNSON seconded the motion, which passed unanimously.

Ventilation.

By CHARLES FERGIE, M.E.,

Intercolonial Coal Mining Co., Westville, N. S.

(Read October 8th, 1902.)

That ventilation is the most important subject requiring the attention of a mine manager, the writer does not believe will be disputed; considering that the safety of the employees, not to mention property, is dependent on the wise and judicious distribution of air throughout a mine.

Ventilation, in order to supply pure air, is necessary, for the reasons—1st, that men and animals must breathe to live; 2nd, that the insidious fire-damp and carbonic acid given off from the surfaces of the bared coal, the breathing of men and horses, and gases produced during the process of blasting with explosives and from burning lamps, must all be diluted and rendered harmless.

The writer does not intend discussing the nature and properties of air and gas, but will confine his few notes to the practical side of ventilation.

The quantity of air required for different mines depends entirely on circumstances, and what would be considered ample in one case, would be totally inadequate in others. Take for instance a mine worked with explosives and where no fire-damp is given off; such a mine would not require the amount of ventilation and attention necessary in another mine where dust and fire-damp have to be contended with. Therefore, for the foregoing reasons, no fixed law can be laid down as to the number of cubic feet of air that shall be sent into every mine for each person employed, the rule as given in the Mines Act being best to follow, namely, that an adequate amount of ventilation shall be constantly produced in every mine to render noxious gases harmless.

In the matter of total ventilation, the writer would point out that the amount of air passed from the downcast and through the upcast of a mine, is no criterion as to the mine's efficient ventilation. To state that a mine is passing so many hundred thousands of cubic feet of air per minute, conveys little or no information as to the condition and safety of the mine. It is not only necessary that air enter the mine, but after doing so it must be so conducted that it reaches the innermost workings and be in sufficient volume to render harmless all gases met with, in addition to providing pure (or as nearly pure as possible) breathing air for the miner.

Ventilation may be considered under two heads—natural and artificial.

Though natural ventilation (caused by the internal heat of the mine, rendered higher by the workmen and their lights, and the difference of level between the downcast and the upcast), is equal to the supply of a certain amount of ventilation, it is of so insignificant moment in the present day of deep and extensive workings, that we do not propose considering it.

Comiug to artificial ventilation, we simply have the choice between that of the furnace and the mechanical fan. The writer does not propose to point out the economical features of the furnace when used in deep mining or its grave defects in gaseous mines, but will merely consider mechanical ventilation as the one and only up-to-date system.

In the choice of a fan, the manager must first ascertain with the water-guage the number of cubic feet of air his mine will require for efficient ventilation, and having determined that point, he will next proceed to study the merits of the several fans manufactured and put on the market, also whether it shall be a direct-driven, belt-driven, or rope-driven fan. It must also be borne in mind that both fan and driving engines have to work continuously, night and day, the whole year round, and that therefore there is little opportunity to stop for repairs; hence the less complicated they are, the better.

Where large volumes and high water-guage are required, the direct-driven fan cannot be considered satisfactory on account of the high piston speed at which the engine must be run, and the considerable vibration set up in the shaft of the ventilating fans.

Where small volumes and low water-guage are required, the direct-driven fan may be found satisfactory, and its first cost of installation less than a belt- or rope-driven one. With belted fans, trouble is liable to be met in the stretching or breaking of the belt, also the possibility of its jumping the pulley. For an up-to-date fan where large volumes and high water-guages are necessary, the rope-driven fan must be given first place for the following reasons: the engines can be run at moderate speeds; being driven through the medium of many cotton ropes, the vibrations of fan or engine are not transferred from one to the other; should one or even two ropes break, the fan continues to run, and need not be stopped to replace the broken ones unless it is convenient to do so; the ropes if properly put on and attended to, will stand for a great number of years. The writer has a fan at work, driven with six cotton ropes, one and three-fourths inches diameter, which were put to work some eight years ago and which look as if they would last as long again.

In choosing driving engines, they should be strong and simple in construction and easy to repair. The writer prefers the twin compound style; the ordinary slide valve with adjustable cut-off valves, and engines arranged so that either the low or high pressure can be worked separately if so desired, or in case of one engine breaking down. The writer considers that the two best fans on the market to-day are the Walker Indestructible Fan and the Capell.

Having selected a fan to produce the required ventilation, it is the manager's next duty to see that his airways are kept of ample area and offer as little resistance to the passage of air as possible; always bearing in mind that for the passage of a

given volume of air, the smaller the air-way the greater the power required, and the more tons of coal burnt at the boilers. The airways should not only be of large area, but, when possible, made as straight as can be; each district of a mine should have its own split of air, and the several splits of the mine should not come together until reaching the main return approaching the upcast. Regulators, doors and air crossings should only be used where absolutely necessary. The prudent mine manager will never allow his airways to be neglected, knowing that if he does so he will not only have difficulty in successfully ventilating his mine and incidentally cause loss of output, but will sooner or later have a large bill of costs for heavy repairs.

The next question to be considered is, shall safety lamps or open lights be used, or both? The writer has no hesitation in saying that the latter (mixed lights) should never be permitted in any mine where it is at all necessary to make use of a safety lamp, and should be strictly prohibited by law. As to whether the mine should be worked with open or closed lights, depends entirely on the condition of the mine, and whether it is a gasey or dusty one. After over twenty-five years experience in all kinds and conditions of coal mines, the writer has arrived at one conclusion; that in any mine where fire-damp exists or has been known to exist, or even where there is no fire-damp but much fine dust, safety lamps only should be permitted.

Next comes the question, shall the coal be worked with or without the use of explosives? That there are a great many seams of coal that could not be worked at a profit without the use of explosives, cannot be questioned; but at the same time there is no doubt that in many seams explosives are made use of where there would be no necessity if the mine were laid out and worked on a different system and with a view to making use of the natural weight and pressure of the overlying rocks. The writer contends that the day has gone for the use of black loose powder in coal mines, and that it should be prohibited altogether.

There are several good so-called safety explosives on the market, and what are spoken of in England as being on the "permitted list," and none others should be allowed. Let a mine be ever so free from gas, but open lights and common blasting powder used, and in time there can only be one result, explosion or fire, and perhaps both. It may be long in coming, but come it will.

It is not enough to alone have an up to-date ventilating plant, large upcast and large airways, etc.; for the mine is not equipped until experienced and trustworthy overmen have been selected and appointed, whose duty it shall be to carefully examine the mine each day, making an accurate written report of its true condition and state. An efficient overman will report every small matter he comes across, which is not in order. The writer has often been asked by examiners if, when they find a small quantity of gas which they readily remove before leaving the place, they should report it? The reply is, yes, report if there is merely a capful and it only takes a minute to clear it out. Examiners are apt at times to think little of these small showings of gas, as not being worth recording; but this is a great mistake. Examiners are the most important officials at a colliery, and only men of experience and of strictly sober habits should be chosen, and they should possess a good clear head, plenty of nerve and a resourceful nature.

In the choice of reliable safety lamps, the manager has several to choose from, and cannot go far astray in selecting from such as the Mueseler, Marsaut, Gray, Hepplewhite Gray, Evan Thomas, and the Protector.

The writer uses the Marsaut. It is strong, easily cleaned, examined and put together; the parts are simple and not complicated, and the double gauze caps should always be used. The lamp should be the property of the company, cleaned and repaired by them, and a correct register kept of each one. The lamp room should be of ample size, airy and with plenty of light, and in charge of a competent and experienced lamp man,

capable of doing all necessary repairs. All lamps previous to being given out, should be carefully examined at the lamp room, and again in the mine, by a competent official, before being allowed to be taken into the workings. In case of a glass being broken or cracked, or the lamp in any way damaged, the person in charge of same should at once leave his work and report to the nearest official, meantime having extinguished the light by drawing down the wick.

The cause of every accident to a lamp should be investigated, and no employee should be supplied with another lamp without a permit from the manager of the mine, who should satisfy himself as to the negligence or otherwise of the owner of the lamp. Where safety lamps are the rule, managers cannot be too strict as to their use. They must be kept not only in thorough repair, but must be carefully handled by both men and boys, who should understand that safety lamps are not placed in their hands to enable them to work in gas and badly ventilated places, but to protect from an outburst or sudden inrush of gas. The moment the workman's lamp indicates that gas is present, he should slowly and carefully withdraw it from such position and retire to where the air is clear, and immediately report the same.

The practice of allowing men to work in places containing gas, simply because they are supplied with safety lamps, cannot be too greatly condemned, and should be considered a breach of the rules. True, there are times when certain work must be done in presence of gas, but when such is necessary it should be carried on by the most careful men, and under the supervision of a competent overman.

With a mine well ventilated, safety lamps only permitted, none but the highest class of safety explosives used, examinations by none but experienced and trustworthy overmen, good discipline, and a careful, experienced mine manager, the chances of a colliery explosion are reduced to a minimum.

DISCUSSION.

R. H. BROWN.—I fully endorse all the recommendations that Mr. Fergie makes. It is a year since I left the Sydney Mines colliery, of which I had charge, and they are carrying out these rules in regard to explosives and safety lamps. At Sydney Mines we had two ventilating fans, one was a Guibal, manufactured by Walker Brothers, and the other was of the Murphy type, built by the Bullock Manufacturing Company of Chicago. The Guibal is thirty feet in diameter and ten feet in width, and at the velocity at which it is driven (fifty-five revolutions per minute), gives 101,000 cubic feet of air per minute. The air is drawn five or six miles along the working faces. The air passages are all divided into different districts, terminating at the fan. We found at first if we worked the fan up to fifty revolutions, it produced vibration, and the makers of the fan devised a patent shutter, which is made of sheet iron, with a triangular orifice which prevents the vibration. The fan can, if necessary, be worked with great velocity. The fan made by the Bullock Manufacturing Company is thirty feet in diameter, and makes fifty-five revolutions per minute. It has travelled something like thirty millions of miles in the fifteen years it has been running. It ran for eleven years without stopping day or night. I beg to propose a vote of thanks to Mr. Fergie for his very able paper.

G. S. TROOP.—I second it.

The motion passed unanimously

INDEX.

JOURNAL

OF

THE MINING SOCIETY

OF

NOVA SCOTIA.

VOL. VIII.

Being the Transactions of the Society during the Year 1903-4.

The Transactions for the Years 1895-6, 1896-7, and 1897-8, will be found in the "Journal of the Federated Canadian Mining Institute," Vols. I, II and III.

EDITED BY H. PIERS

UNDER DIRECTION OF A COMMITTEE OF THE SOCIETY.

COPIES OF ALL THE SOCIETY'S TRANSACTIONS MAY BE OBTAINED ON APPLICATION TO THE SECRETARY

AT

THE ROOMS OF THE SOCIETY, HALIFAX, N. S.

1904.

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CONTENTS.

(For index see last pages).

PAPERS.

Errata.—Page 105, 11th line from top, read "The refuse contains about 40 p. c. slate and 15 p. c. of sulphur."
" " 19th line from top, omit "roughly."

PROCEEDINGS.

TRANSACTIONS

OF

The Mining Society of Nova Scotia.

The Society as a body is not responsible for the opinions and views expressed in the several papers published in the Transactions.

VOL. VIII. SESSION 1903-04.

ANNUAL MEETING, FEBRUARY, 1903.

The annual meeting of the Mining Society of Nova Scotia was held in the Halifax Hotel, Halifax, on the 19th of February, 1903, at 11 o'clock, with the president, George W. Stuart, in the chair.

Among those present were: President George W. Stuart, of the Nova Scotia and Mexican Mining Co.; Hon. Robert Drummond, editor of "Maritime Mining Record"; Alexander McNeil, director Port Hood Coal Co.; Henry S. Poole; Charles C. Starr, of John Starr & Son; Fred. P. Ronnan, editor of "Industrial Advocate"; Prof. J. E. Woodman, Dalhousie School of Mining; Francis H. Mason, assayer; R. H. Brown; Charles Archibald; Clarence H. Dimock, manager of Wentworth Gypsum Co.; George S. Burritt, agent Canadian Rand Drill Co.; W. C. Milner, W. F. Jennison, of Dominion Iron and Steel Co.; J. G. Hudson, Sydney; Joseph H. Austen, of Austen Bros.; J. G. McNulty, of Nova Scotia Gold Mining Co.; M. R. Morrow, agent Dominion Coal Co.; F. W. Hanright, of Colonial Copper Co.; John H. Anderson; Duncan McDonald, manager Truro

Foundry Co.; Prof. D. A. Murray, Dalhousie College; A. N. Whitman, pres. Richardson Gold Mining Co.; John Johnson, of Nova Scotia Coal Co.; Prof. Ebenezer MacKay, Dalhousie College; Robert Dixon, of Strathcona Mine; George E. Boak; Geoffrey Morrow, of Wm. Stairs, Son & Morrow; Dr. A. H. MacKay, Superintendent of Education; Harry Piers, curator of Provincial Museum; Robert Kaulback, manager Touquoy Mine; G. S. Troop, of Black, Bros. & Co.; H. A. Sanders, of Forest Hill Mining Co.; H. Reid Harrison, of Cheticamp Gold Mining Co.; Todd C. Woodworth; James T. Burchell, manager Gowrie Blockhouse Colleries; E. Percy Brown, Thomas Caldwell, L. J. Hesslein; E. M. McDonald, M.P.P.; John R. McLeod; J. E. Hampson, and H. M. Wylde.

The Secretary read the minutes of the last meeting, which were confirmed.

ELECTION OF MEMBERS.

The following members were elected:—Arthur Roberts, Bridgewater; Edward James Cooper-Smith, Malaga; Francis Drake, Malaga; E. H. Emmerson, manager of the Waverley Gold Mining Company, Waverley; D. C. Hood, Waverley; F. B. Wade, K.C., Halifax; W. L. Lithgow, manager Port Hood Coal Co., Halifax; Cornelius Shields, vice-president Dominion Iron & Steel Co., Sydney; Harry Coll, manager of the Vale Colliery, Thorburn; J. L. Brass, manager Inverness & Richmond Railway Co.; R. A. C. McNally, agent James Cooper Manufacturing Co., Halifax; C. Ochiltree Macdonald, Halifax; Prof. J. E. Woodman, Dalhousie School of Mining, Halifax; G. Herrick Duggan, Dominion Iron & Steel Co., Sydney; J. G. Hudson, mining engineer: C. Crockett, New Glasgow; and John Johnson, resident manager N. S. Steel & Coal Co., Sydney Mines.

PRESIDENT'S ADDRESS.

THE PRESIDENT, GEORGE W. STUART.—It is very pleasing to be able to refer to the healthy condition of the society, both financially and socially. In all such institutions unity of spirit stands paramount. A definite object, with the energy and application to overtake it comes next; and while we do not want enough cash in the treasury to generate the desire of spoilation, yet we require, and we have, enough to keep the wolf from the door, appear decently clad, and also a few hundreds to spend for any good purpose looking to the protection of the society and the promotion of Nova Scotia's great mining industries.

We have now one hundred and fourteen members in good standing, an increase of twenty-seven in the last year. We are not called upon at this meeting to pass a single resolution of condolence; the "sting of the reaper" has not found a victim amongst us during the past year, for which we sincerely offer our grateful thanks to the Supreme Governor and Provider. The attendance at our meetings has been very good as compared with previous years. I would urge that every member attend at least one meeting each year.

We have had some excellent papers read, containing much valuable information, yet many more might and should have been contributed. I think it is the duty of each member to give the society, if possible, one paper each year—it is not expected that every member shall prepare a paper of exceeding merit. There are many things connected with the great mineral industry, both practical and technical, to write about; if one feels he cannot handle any of the larger subjects, let him give an hour to some of the innumerable smaller ones; if you cannot do better, submit some of the many questions that frequently confront us, for one of our chief aims is to give and to receive information.

The past year has been one of great and unprecedented activity in our mining and manufacturing enterprises. Never before in the history of this province has there been such a demand for labor, so many men employed, and such satisfactory wages paid. Work has gone on with a frictionless swing, showing the best of feeling between employer and employee, while our neighbors across the line have experienced from strikes the most disastrous year in their history, causing a shortage in their anthracite coal output of not less than twenty-eight million tons. Estimate, if you can, the financial loss and the physical suffering this national calamity has entailed. While we feel comparatively safe from such calamitous troubles, due to a superior and more intelligent class of employees and wiser and more generous management, yet it behooves us to be ever watchful. To the wage earner in whatever capacity he may serve, let me say that while all of us have our hopes and aspirations, yet a wise direction of our energies is required more than a " vaulting ambition which sometimes o'erleaps itself."

The output of coal during the past year has been no less than 4,362,869 tons of 2240 lbs., being 737,504 tons in excess of the previous year. 439,731 tons of iron have been manufactured into 206,193 tons of pig, against 90,034 tons manufactured in 1901; the greater portion of the ore, however, was brought from the Wabana mines, Newfoundland. The inducements offered by the government for the encouragement of the manufacture of iron and steel in this country should be so regulated as to insure the greater development of our own ore deposits.

There has been a falling off of 2,258 ounces of gold as returned to the mines office, as compared with 1901, when 30,537 ounces were returned. The past year's production is almost entirely from the larger and more modernly equipped mines, and from deeper workings, operations on most of the smaller mines having ceased. This is due largely to the fact that mine owners, having observed the successful operation of the more modernly equipped mines, are now less disposed to let their holdings to

tributors, rather conserving their interests, looking forward to being able to work them on a larger scale. There are in process of construction throughout the various districts, a number of large and modern plants, both for milling and mining on a large scale and to much greater depths.

In all other branches of mining, except in barytes, there has been a large increase. May we not be warranted in believing that Nova Scotia is just now shedding the mantle which has so long covered her glory and is unbosoming a display of mineral wealth the magnitude of which must inevitably turn the eyes of the world's capitalists towards her ?

In a recent article in the New York " World," the following appeared :—" It is an undeniable fact that the most influential business men of the world have turned their attention to mining ; the richest men in the world are mining kings, many of whom have grown so from originally moderate capital."

Perhaps it cannot be literally said that we are living in a land flowing with milk and honey, but I will venture the assertion that we are living in a land which contains beneath its surface more to the square mile of that which interests capital, gives employment to the millions, and makes a country rich, than any other of the same dimensions on the face of the globe.

The four and a half millions of tons of coal that have been mined in the past year are but a drop in the bucket when we consider the insignificant area from which this tonnage has been taken, as compared with an estimated area of 950 square miles, under which our best authorities—men who have devoted their lives to the study of geology and mineralogy—declare, without a doubt, that coal abounds. Within this area, it is estimated there are from forty to fifty billions of tons ; there are, besides this area referred to, many hundreds of square miles of territory unproved, in which it is confidently believed coal exists in large quantities.

Of the extent of our iron ores we know that in no less than twelve counties of the eighteen in the province, large and valu-

able deposits exist, and we also know that shrewd capitalists, after exhaustive examinations, are spending millions of money n the province in the erection of suitable plants for the manufacture of iron and steel.

Were we to make an approximate estimate of our gold resources, based on the same character of evidence as that accepted and undisputed in reference to our coal and our iron—and why should we not?—we must conclude that we have in gold unbounded wealth. The best authorities give the area of our gold measures at 5,000 square miles, and Mr. Fairbault demonstrates, in the most conclusive manner, that the auriferous folds in the area in which the gold veins occur, go to a depth varying from 3,000 to 17,000 feet.

Let me dwell a little upon this branch of our mining industry. It is but natural I should give it the preference. I have said we have abundant evidence of the persistence in depth of our gold-bearing veins. That statement up to within the past year or two might have been questioned; I think few to-day will be found to question the statement in view of the recent developments throughout the province, and more particularly in the districts of Brookfield, Caribou, Goldenville and Stormont.

With such evidence before us, can we for a moment doubt that at greater depths than we formerly dared to believe, we have both larger and richer deposits of ore than have been found nearer the surface? It is true that larger capital, better equipment, and more efficient management are required to make our output of gold equal in significance to that of our coal. But while we take pleasure in speaking of the bright side of our gold mining industry, it is equally incumbent upon us to speak of some of the difficulties that confront us in the prosecution of this, the most fascinating, and sometimes at least, if not always, the most profitable of industries. While the cost of everything that enters into the prosecution of the gold mining business, including labor, fuel, timber, etc., is regulated by

the supply and demand, the value of gold is fixed at a standard: it is worth no more in this century than it was in the last, while the average cost of all the requirements necessary to obtain it has increased from twenty-five to fifty per cent. in the last decade. The question naturally arises, will the yield under these conditions continue to supply the increased demand, and will the industry continue in this province, as is most desirable it should? How is the yield being kept up now? It has hitherto been maintained, not so much by the discoveries of new fields, as by the improvements in the methods of mining and the wonderful inventions in mechanical devices and chemical discoveries for its recovery. It is with not a little pride that we can announce these achievements, enabling us by our ingenuity in this way to meet the increased cost of labor and supplies. While all other producers increase the price of their products to meet the demand, yet you must not forget there is a limit; we fear we have reached the minimum cost of production. Therefore, gentlemen, notwithstanding the bright side of this industry that comes from the "deeps," you must recognize the seriousness of the situation. Is not this great industry—the production of gold—paramount in importance? It is the one article that cannot be substituted. The substantiality of it gives not only impulse and pulsation to power and influence in trade and commerce, but is the bulwark of all stable governments, and the one great and indispensable article of commerce that cannot be cursed by Morganism, but the production of which may be crippled by indifferent, injudicious and parsimonious legislation.

The difficulties which the people who have invested their capital in the gold mining business are laboring under, are not of such a character that they can be remedied by acts of parliament. There are, however, in addition to these enumerated, most serious hindrances, hardships and menaces to the industry in this province, all of which can and should be remedied by legislation. I will but briefly refer to some of them by asking two questions:—

1st. With a fixed rate of value on our gold product and the ever-increasing cost on all that is required to produce it, why should we be burdened with a royalty tax, while other enterprises that can, and do, regulate the price of their product to meet the demands and exigencies, are liberally and even excessively bountied and subsidized? Please bear in mind that the consumer pays all royalties exacted; except that on gold, which is borne by the producer. If the government considers that the abolition of the royalty on the gold product would not be consistent, let it offer some other concession equal in its advantages.

2nd. If the exaction of a royalty is to be continued, under heavy penalty from the legitimate miner, demanding that he shall, under oath, register the mine, the mill and the area from which every ounce of gold he offers for sale has been taken, why is the thief and his aider aud abettor permitted to sell in open violation of the law and no effort made to collect royalty or protect the law-abiding and suffering mine owner? One of our sister British colonies, West Australia, similarly engaged in the gold mining business, recently placed upon her statute books an act remedying this pernicious evil, which exists in our own province to an alarming extent. I trust this question will be taken up to-day and dealt with in no uncertain manner.

Another question of extreme importance to us all, is that of technical education. In this connection you will be asked during the meeting to consider the notice of motion given by Mr. Drummond, that this society offer a scholarship in the Dalhousie School of Mining. The suggestion is both opportune and commendable, and I am sure will meet with your approbation.

This brings us to the recent move of that good old institution, Dalhousie, to establish a school of mines in connection with her other university courses. This important movement was made too late in the season for particulars to appear in this

year's calendar of the university, but I assume it is to follow the lines of other institutions in devoting the first two years to chemistry, physics, mathematics, geology, mineralogy, and mechanics, and the last two years to mining and metallurgy. I notice that the faculty of science at the university includes the names of four members of this society, viz., Poole, Archibald, Gilpin and Mason, and I assume that the board of governors has consulted these gentlemen with regard to the best possible programme to offer to the public, and I feel that we can safely leave the matter in their hands, for they are men who not only know what a school of mining ought to be, but they know what the requirements of the mining and metallurgical industries of this province are, and are thus able to prepare a curriculum which will fit students to fill those requirements.

It has been said, and very truly, that the component parts necessary to make a successful mining or metallurgical engineer are nine parts of common sense and one part of scientific knowledge, the latter being absolutely useless without the former to apply at the right time and place. Thus, for instance, every chemist knew that gold would dissolve in solutions of chlorine and potassium cyanide years before Plattner and MacArthur respectively applied these solvents to the extraction of gold from its ores. And again, everyone knew that carbon, silicon and sulphur were really oxidizable substances at high temperatures many years before Bessemer devised that most beautiful of all metallurgical processes, which bears his name, in which by blowing air through molten iron, he was able not only to eliminate those substances from the metal, but to actually use them as a fuel to bring about their own combustion.

The formation of a school of mines for Nova Scotia will, if properly begun and carried out, mark an epoch in the mining industry of this country. It will supply us with young men possessing that necessary ten per cent. of scientific knowledge in their make up, and we Nova Scotians who have produced such men as Dawson, Howe, Thompson, Tupper, Grant, Fielding, and

others, will feel satisfied that at least a fair proportion will possess that essential ninety per cent. of common sense. It must be borne in mind, however, that a university course in mining engineering is only intended to give the student a thorough grounding in the sciences underlying the art, which will be useful in after life if he has the aptitude of applying the knowledge at the proper time. It is not for one moment expected that a student who has graduated from Dalhousie or any other university is qualified to take a position as manager of a mine or metallurgical works at the close of his college course. He has first to doff his college clothes and don the workman's garb and go into the mine, the field, or the workshop, and there learn to apply the knowledge he has gained in his three or four years at college, and thus ultimately qualify himself for the position he is aiming for.

We are often reminded of the splendid polytechnical schools of Germany, as affording the very highest class of technical education. Let me quote to you a paragraph from the report of the British royal commission on technical instruction, 1894, which is incorporated in an American circular of instruction issued from Washington, 1895:—

"Reference has already been made to the evidence that the increasing demand for men whose training has been largely practical, to fill stations of trust and responsibility, has lessened the demand for those of high but purely theoretical scientific attainments. The commission found in Germany an increase of 1000 well-trained polytechnical graduates over the demand, and they were informed that the manager of a large engineering works had been so importuned by these young men for employment that he put up a notice in his window—'No polytechnic student need apply.'"

The Baron Von Eybesfeld, Austrian minister of instruction, expresses himself thus:

"The most serious problem in education in this country is to reduce the number of theoretical engineers who, after their

long course of study, find themselves not wanted, and to increase the number of men whose training and practice had been so combined that they could meet the great demand for those who can put theory and practice together.

"I cannot urge too strongly the absolute necessity of practical experience interspersed with the technical, but which must cover more than a few weeks or months before a college-bred young man can possibly become a successful manager, either as his own master or as an employee."

I wish I could feel my duty done on this occasion and leave this subject here, but I cannot. Every man in this country with his heart in the right place, must admire the noble effort of Dalhousie, an effort the necessity of which has been forced upon the governors of that institution by the great and growing need and the exceptional opportunities this province offers for such an institution. I say exceptional, because almost at the very doors of an institution of this kind, situated anywhere in the province, mines are in operation, giving the students opportunities not obtainable near other institutions of the kind. All this is to our advantage and in favor of Dalhousie's efforts. But can Dalhousie establish and maintain a school of mines to compare favorably with the heavily subsidized and gift-laden institutions of Kingston, Toronto, and Montreal, and the many similar institutions in the United States, some of them even nearer to us than those in the upper provinces?

Can we feel assured that this province will have what she requires, and what she is entitled to, as regards a school of mines? Do we not require an institution at least equal to those near us, in order to insure the retaining of scores of young men who are hungering after opportunities for higher education, that they may be enabled to take more advanced and more responsible positions in the development of our great mineral resources?

I trust you will not misconstrue my remarks. I would not utter one word to discourage Dalhousie, but I would urge and

proclaim in the most unequivocal manner that it is the duty of the government of the province to give a grant to or subsidize (term it what you choose) such an institution as a school of mines, to the extent of at least one hundred thousand dollars a year for a period of years, under such terms and conditions as will remove the possibility of any feeling savoring of the denominational. Failing to see the advisability or practicability of such a course, then let them pursue a grander and more national one in the establishment of a government school of mines, such as the income from the mines of this province warrants, and the mineral resources and developments of the country demand.

Would you ask further reason for such a demand on the government? My answer is that the phenomenal development of mining in this province has increased the revenue from royalties in the past twenty years from one hundred thousand to half a million dollars, and a more rapid increase is assured in the future; and, further, while other provinces have established, and are supporting such institutions, the province of Nova Scotia receives a revenue from royalties much greater than the revenue from the same source in all the other provinces combined.

I intended to refer to-day to the great need here of a mines and miners' registry office; and there are several other matters properly coming under the consideration of this society, relating to our mineral industry, that I also intended to refer to, but I feel that I have already drawn too heavily upon your time. Therefore, gentlemen, in closing, permit me to remind you that we mining men in this country have yet many great problems before us to be solved, which can only be done by degrees, requiring as they do, much patience, perseverance, and research, not forgetting a compound of those indispensable elements to the assurance of success—honesty, courage, and common sense. Reminding you once more of the great expansion of the industrial wealth of this little province, I feel that I

am not claiming too much when I say that the question of her great probabilities becoming assured successes, depends in no little measure upon the united, sustained and strenuous efforts of this institution—the Mining Society of Nova Scotia.

A vote of thanks was unanimously adopted and tendered to President Stuart for his address.

The Treasurer's report was read and adopted.

MISCELLANEOUS BUSINESS.

H. S. POOLE.—It used to be the practice in the past of giving to each member a copy of a mining paper at the society's expense. I think it would be well to continue that practice. I therefore move that we obtain copies of each of the local journals dealing in mining matters, one on coal and one on gold ("The Maritime Mining Record" and "The Industrial Advocate") and that they be given to each member, at the cost of the society, leaving it to the council to make the best terms it can with the publishers of the different journals.

HON. S. H. HOLMES seconded the motion, which passed unanimously.

Communications were read from the "Morning Chronicle" and "The Industrial Advocate" in regard to special mining editions which they propose to publish. The communications were referred to the executive of the society.

A. MCNEIL.—It would be in the interest of the society to secure an act of incorporation and have our constitution and bye-laws based thereon.

On motion, it was decided to instruct the executive to secure such act of incorporation.

The afternoon session opened at 2.30 o'clock, in the government's new building.

THEFT OF GOLD.

R. KAULBACH.—The theft of gold at the mines is a matter which has been of great importance to me, and it has been before the society in the past. We have had a great deal of difficulty during the past two years with regard to this matter at Moose River, the district in which I am operating. We undertook to bring some of the suspected persons to justice, but were unable to have them convicted, owing to the fact that we have not sufficient laws to protect us in such cases. The law, as it now is, requires mining operators, after mining and milling their ore and putting it into bullion, to make a monthly return and pay a royalty of two per cent. to the government. We are compelled as operators to do this, while on the other hand any person can mortar and sell gold without paying royalty. Last year we had a man under arrest for buying gold alleged to have been stolen, and we brought him to Halifax, but were unable to convict him owing to a defect in the law. We could not identify the gold, although we knew it came from our mine. The judge said he sympathised with us in the case, as he had other similar cases before him. Within the last fortnight I have had information that the same person has been again mortaring gold, although there has been no tributing work done in the immediate vicinity of his place. We should have a law to protect the gold mining industry of this country. It should not be necessary for us to prove where such a man obtained gold. The burden should be on him of satisfactorily explaining where he obtained it. The Hon. F. A. Laurence has promised to give us every assistance he can in the House of Assembly in getting proper legislation passed. Other mining men are here, and probably they have experienced the same difficulty we have.

PRESIDENT STUART.—We cabled some six weeks ago to Australia for a copy of their law on the subject, and we have a reply from the attorney general, saying that he had mailed a copy, but, unfortunately, it has not yet reached us.

F. P. RONNAN.—In the last issue of my paper, the "Industrial Advocate," I had an article on this question, and probably it would interest the members if the secretary read it.

SECRETARY WYLDE then read the article, as follows:

"From time to time the question of protecting mine owners from the dishonesty of their workmen crops up in Nova Scotia, and the Mining Society has grappled with the subject on many occasions without any great measure of success. All countries possessing free-gold deposits are liable to the same difficulty in the detection and punishment of thieves who contribute so much to the depreciation of values in an ordinary free-milling mine where the gold is coarse and easily portable. The main obstacle in the past has been the identification of stolen quartz, and the following reference from an Australian paper of recent date might suggest some action in Nova Scotia that would be sufficient to overcome the present disabilities:—

"'A most necessary and long-looked-for amendment is provided in the Police Amendment Bill recently introduced into the Westralian legislative assembly in regard to gold stealing. The difficulty at the present time is that if a mine owner brings a charge of gold stealing against a person, he is asked to identify the gold itself—an almost impossible thing to do. The advantage of the provision in the present measure is that a person has merely to be proved to be in possession of the gold which is reasonably supposed to have been stolen. The attorney-general, in moving the second reading of the bill, said,—The clauses appeared to be rendered necessery in view of the grave fact that gold stealing was rampant on the golden belt. Efforts have been made time after time to check the continued growth of these robberies, but without success. The companies have employed detectives, who have brought prosecutions and used their utmost endeavors to enforce the existing law. They have, however, failed, and the evil is of larger proportions to-day than ever before. There is an urgent need for the amendment of the law.

It is provided in the new bill that any person charged with having on his person or cart or vehicle, or in his possession or on premises of which he is the tenant or occupier, any gold (meaning gold bullion, retorted gold, gold ores, alluvial gold, gold amalgam, gold alloys, zinc precipitates, slag, concentrates, tailings, residues and unwrought gold in any form), reasonably suspected of being stolen or unlawfully obtained, and who does not prove that he came by it lawfully, will be liable to a fine of not exceeding £50, or a term of imprisonment not exceeding six months. The question of accessories is also dealt with. The amending bill will be highly embarrassing to the receivers of stolen gold, but will not in any way interfere with legitimate dealers. First catch the thief, and the remainder is an easy matter for disposal.'

"This is good law that the burden of proving lawful possession should rest upon the suspected person. It is, of course, somewhat in conflict with the old English maxim of presuming a man innocent until adjudged guilty, but the circumstances call for some such departure."

PRESIDENT STUART.—The Nova Scotian government makes laws dealing with the illicit sale of intoxicating liquors, and also with the protection of game, and it seems to me that the passing of an act to prevent the theft of gold would come under its jurisdiction. I think the best way, perhaps, to deal with this matter is to pass a resolution asking the provincial government to take the matter up, and if it is not within its jurisdiction, to ask the Dominion government for power to deal with it. That might be done by resolution, as I have suggested, or a committee might be appointed to wait on the government and place the matter before it. I do not see why the local government should not interest itself in this matter; in fact I have every reason to think that it will, if the suggestion comes from us.

HON. S. H. HOLMES.—It appears to me that it would be best to ask assistance from the Dominion government directly. In order to give the local legislature power to deal with such a measure, you would have to have the British North America act amended.

H. S. POOLE.—In 1870 there was an act such as we require on the Dominion statute book.

F. P. RONNAN.—Why not have concerted action also by the various mining societies in other parts of the Dominion? I think the advantages of such legislation are so apparent that there should be no difficulty in getting other societies to help us.

H. S. POOLE.—Most of the gold in the west is not obtained in the same way that it is in Nova Scotia, and so the matter does not come home to the western people as forcibly as it does to us.

F. P. RONNAN.—But they would recognize the good principle of it.

R. KAULBACH.—I move that this matter be left to the council of the society to deal with it as it may deem necessary.

HON. S. H. HOLMES seconded the motion which passed unanimously.

(Further discussion on the subject of theft of gold, will be found on page 30.)

MINING SOCIETY SCHOLARSHIP AND TECHNICAL EDUCATION.

HON. R. DRUMMOND.—I move that this society endow a scholarship in the mining school of the University of Dalhousie College. We profess to wish to see technical education carried out, and we have to show our sympathy in a practical manner. At this time, this is the only channel in which we can exhibit our sympathy. We should show a good example to the government. The details could be left to the executive of the society.

D. MCDONALD.—I would like to ask Mr. Drummond if the scholarship would only be open to coal-mine managers? Should not gold-mine managers have the benefits of this scholarship as well?

HON. R. DRUMMOND.—There are no schools now established in this country in connection with gold mining, and under these circumstances how could you select fit and proper candidates? There are now in existence coal-mining schools, and the scholarship should be open to the best graduates of these schools. I would be perfectly willing to extend the privilige to the gold-mining men if it can be pointed out how it could be done

D. MCDONALD.—I think that both these classes of mining men should have equal advantages and opportunities. If a gold-mining company organizes to-day, it has to go out of the country for a first-class man to take charge of its mine. We should encourage the education of gold-mining men so that they could take charge of a mine when called upon to do so. If we are going in for technical education, I believe our gold miners should be included in the list of those who can take advantage of any scholarship offered.

F. P. RONNAN.—Why not establish a scholarship to be open to all young men? I do not see why it should be restricted to the coal-mining men. The coal-mining industry has been already assisted by the local mining schools.

HON. R. DRUMMOND.—I would be very sorry indeed to have made the motion if I thought there would be any clashing of interest. If the gold-mining men can put us in the way of endowing a scholarship for gold-miners, we will be most happy to entertain it. Is it fair that the coal-miner should have to wait for assistance until the gold-miners are so situated that they can take advantage of it? We can do something now to show our sympathy for technical education, and that we can do by endowing a scholarship.

D. MCDONALD.—Hon. Mr. Drummond must not think that I am trying to throw cold water on this proposal. I want to do everything that lies in my power to aid men to get a mining education. But why should we not have our young men who are growing up around our gold mines, examined in the mining schools, and why should they not have certificates issued them? That is all we ask. We have young men in our gold mines aspiring to higher positions, but they have never received any encouragement. I do not see why our young gold miners could not be examined in order to qualify as underground managers and managers. Why can we not get our gold mines on the same footing as the coal mines?

A. MCNEIL.—Since this matter of technical education has come up in the society, I have taken a good deal of interest in it. You know we have consistently advocated a particular policy. That policy is, that the government should appoint a commission of suitable men to enquire into the experiences of other countries, and also into the condition of education in this province. One of the leading conditions of a successful system of technical education is that the basis be a sound one—that the general system of education which forms the basis of higher technical education should be suitable. This commission should enquire into the system most suitable to our own province. We carried that policy before two large committees of the house of assembly last session, and the recommendation we

made on behalf of this society was unanimously adopted by those committees, and the recommendation of those committees was unanimously adopted by the house of assembly. So it is the government that has to decide upon this whole question to-day. Now the gentleman who made this motion is impatient, and very naturally impatient, that something should be done in the meantime. He is perhaps in closer touch with the coal-mining industry than any other man in this province. He knows better than any other man in the province the great need for well-trained men, and he would like to see something done at once towards filling that demand. That is a most natural and laudable desire. But their is just one thing to guard against, and that is, doing anything at present that would interfere with securing what is best for the province. But I am not quite clear whether it is intended that the scholarship shall be a lump sum for one year or not.

HON. R. DRUMMOND.—A lump sum for one year.

A. MCNEIL.—If that is the case, I do not think very much would be accomplished, especially as it is only for one year. To be very beneficial it would have to be continued for a period of years. The gold-mining men of this province say that in order to get men to take the higher positions in the auriferous mines in the country, they are obliged to-day to go outside of the province for them. The gold-mining territory of this province embraces an area of 5,000 miles or about one-fourth the surface of the province. We have the highest authority in the Dominion saying that the gold-bearing measures extend to a great depth, and this has been demonstrated to us by actual facts. I say that we are not in earnest if we speak of the instruction we require in a half-hearted spirit or speak of the institution that we need as one that will cost little money. We must have in view an institution that will take its place with the best institutions in the world. I do not care whether we get it in ten years or twenty

years, if we do not start with true ideals, if we do not start with a clear perception of what is needed, we will never reach the right result. And any proposition of giving a scholarship to an institution which cannot achieve that result, will be useless. I can see that no single body, outside of the government, can hope to get the money that we require to build and equip such an institution. We need information on this subject, and we do not wish to proceed before we have that information. We desire the government to get that information. Indeed we should insist that the government should do so, and in doing so, the government should take advantage of the experience of other countries in this connection. They have had experience in the United States and in Germany with respect to this subject, and it is the duty of our government to get the benefit of that experience.

J. G. McNULTY.—I am a graduate of a school of mines at Freiberg, Germany. There we had a school of mines not only for educating mining engineers, but also for educating mine foremen. What we, to-day, should do in this province, is to educate our foremen. I, as an American student, had to pay $25 a year at Freiberg. A native student paid nothing. A state student was given means from the government to carry him through his course. This school at Freiberg is about two hundred years old. There were about three hundred students attending it at one time—twenty-five of whom were from the United States. It is entirely run by the Kingdom of Saxony..

PROFESSOR E. MACKAY.—The question that is now under discussion, namely, technical education in mining, is one that is of much interest. It is to my mind the most important educational question that the province has to solve, and one which must be solved in some way in the near future. Two alternatives seem to be under discussion at the present time, and they do not appear to be wholly inconsistent. I quite agree with Mr. McNeil that we should profit by the experience of other

countries, and particularly we may look with advantage to other institutions in Canada itself. Two or three of these institutions have attained a certain magnitude and have done work that is of great value. It is quite possible to place before ourselves an ideal, and it is quite right that we should do so. We can only do the best work when we have a lofty ideal. But shall we do nothing because the ideal we put before ourselves is unattainable in the near future? What we should do, is to work in the direction of an ideal, and to begin doing something at the present time. Let us start on the right road directed towards that ideal. Because we cannot get two millions of dollars to-morrow, is not a reason for inactivity; let us be careful that we are directing our efforts towards that ideal which all of us have in view. If we look at the history of the institutions in Canada at the present time, if we look at their origin, shall we find that that has been the principle which has guided them? Take the mining department of McGill University. For two or three years it did its work on a relatively small scale, but it went on in the right direction. Exactly the same thing is true of the Kingston school of mines. Professor Goodwin, during his last visit to Halifax, on a public occasion reminded those who heard him that it was doing extremely valuable work. Now at this school of mines a very small part only of $2,000,000 has been spent; but ultimately I hope that amount will be spent. The same thing is true of almost any other institution. It is possible to direct the work of an institution in a certain direction and to do admirable work, and to do work that needs doing and which would be of permanent value, and yet not at a cost of $2,000,000. It is necessary to keep in view what we might do with such an amount. There is not, of course, an institution in Canada at the present time that comes anywhere near the ideal institution. I do not think there is one in America at the present day that comes up to the ideal institution, but there are some which approach it.

What we should do to-day, in my opinion, is not to defer the matter until we can spring into the arena with a fully equipped institution, ready to do everything. If it were possible to have $2,000,000 given us at the present time by some magical benefactor, it is very likely that at the outset a great many mistakes would be made. The needs of Nova Scotia are not identical with the needs of any other country. We have to find out by experience what particular kind of work is best adapted to the needs of this province. I think, therefore, the way to reach our institution is to begin with the resources at our command, keeping, however, before us the ideals of which Mr. McNeil has spoken.

Such an institution should have the capacity of entering upon and maintaining investigations as to the proper treatment of the various kinds of gold ores of this province. It should be able to inaugurate and complete such investigations. In fact, it should be the repository of all sorts of knowledge to be gained by investigations of mining conditions in Nova Scotia. Now, investigations of this sort are very expensive, and require an extensive plant. But investigations can be carried on of very great value to the province without a fully equipped plant. The necessary plant will not cost many thousand dollars—it may not be an ideal plant, but it will be in the direction of an ideal plant. The Toronto School of Mines, which is doing, I understand, good work, started in a comparatively modest way. What is essential is, that the proper standard should be kept in view, and that the proper ideals should also be kept in view—and in so far as our means allow us, that should be carried out. Because we cannot get our two millions of dollars at first, seems to be absolutely no reason why we should not go on in the direction of an ideal institution. There is much to be done before we could spend that sum to advantage.

There has been made by Dalhousie College, in Halifax, a resolute attempt to solve this important problem of technical education. It is not three quarters of a year ago since that at-

tempt was publicly inaugurated. It has in the meantime made progress. Classes have been organized, but all will not be started until next year. The appointment to the chair of mining and metallurgy will be made during the next few months. Ideals will be kept in mind just as in the starting of the Massachusetts Institute of Technology, the name of which institution everybody now respects. It started in a comparatively modest way. So did the Columbia School of Mines. There is no such thing as a thoroughly equipped, fully endowed institution, capable of doing the work of the province, springing immediately into existence. The thing is impossible. Even if we had the money, we have yet to acquire the experience as to what can be done economically.

We shall best be forwarding the interests of mining—of that particular branch of higher technical education in this province, if we do the very best we can with something less than the vast amount of money that has been mentioned. We should try to do the best we can with our very limited means. The most important question before us at the present time is, how shall we best proceed in the public interest of Nova Scotia? To my mind it is better to acquire some little experience and build up, as has been done in other institutions, either directly under government control or otherwise—build up an institution gradually, and acquire experience as we go along.

PROFESSOR D. A. MURRAY.—I agree with Professor MacKay that in Nova Scotia, a comparatively poor province, we have not money to expend in large amounts. We will have to build gradually. In a society like this, particularly interested in one branch of technical education, we will have to consider that first of all. The main question was touched upon by the Hon. Mr. Drummond—all that a society like this can do is to encourage the idea of having a technical school. If this society should devise any way of bringing technical education before the people and before the government, it would

be doing a very good thing for the whole province. As I am not a member of this society, I shall not suggest a method. If a school were only started in a small way, it would do a great deal of good for the province. What we want here is to have public opinion educated, and I think the government is only waiting until public opinion is educated.

H. S. POOLE.—We discussed this question last year. After hearing the matter again discussed, I think it would be better to fall back upon our former proposition of obtaining a commission. I will, therefore, second the proposal of Mr. McNeil, that we should again press for a commission to enquire fully into the subject.

HON. R. DRUMMOND.—That does not interfere with my resolution relative to a scholarship.

H. S. POOLE.—Your resolution was not seconded. It was not clear enough to generally satisfy our members. If you draw up your resolution so that the scholarship would be open to all mining men, irrespective of gold, coal or iron, then there would not be the least opposition to it. No favouritism should be shown. Perhaps you would test the sincerity of the society by letting it select one man out of three or four candidates?

HON. R. DRUMMOND.—That is the very thing I wish to avoid. The man who had the greatest influence would get the scholarship. If the gold-mining men can pick out a deserving young man he could be sent to Dalhousie at the society's expense.

H. S. POOLE.—I can pick out one.

J. G. MCNULTY.—I can name two, assistants of mine at Waverley.

HON. R. DRUMMOND.—The reason I mentioned coal miners, was because I did not see how we could get any other men.

H. S. POOLE.—The motion of Mr. McNeil was: Resolved that the government be asked to appoint a commission composed of able, independent and impartial men who shall enquire fully into the subject of technical education and the best primary work as a prepartion therefor as now carried on in other countries and the method best suited to the needs of Nova Scotia.

The motion passed unanimously.

HON. S. H. HOLMES.—I do not think the society is fairly chargeable with the accusation that it is not in earnest, that it is not desirous of advancing technical education, and I move that the council of the society be authorized to endow a scholarship in any institution it may think proper, for the purpose of sending a scholar to the school for one year if it thinks it advisable, the council to have the selection of the person who is to receive the benefit of the scholarship. If the society agrees to that, it will show that it is desirous of assisting any man we may desire to send there. Who shall examine that man, may be left to the institution to which he may be seeking admission. The society that provides the money should have some voice in the approval of the candidate.

C. C. STARR seconded Mr. Holmes' motion which passed unanimously.

PAPERS READ.

The following papers were read:—

On the Corrosive Action of Boiler Feed Waters, by F. H. Mason. (Reproduced elsewhere.)

Some Aspects of Technical Education, by Prof. T. B. Kidner. (Reproduced elsewhere.)

Observations on Gold Milling, by J. G. McNulty. (Reproduced elsewhere.)

On the Thawing of Dynamite, by J. G. McNulty.

The Modern Method of Coal Washing, by C. A. Meissner. (Reproduced elsewhere.)

Notes on the History of Manganese Mining in Nova Scotia, by W. F. Jennison. (Reproduced elsewhere.)

Stamp Milling Practice in Nova Scotia, by M. R. O'Shaughnessy. (Reproduced elsewhere.)

MISCELLANEOUS BUSINESS.

A. McNEIL.—In order that this society should show its appreciation of the work done by Professor Kidner in the field of manual training in this province, I move that he be made an honorary member of the society.

M. R. MORROW seconded the motion which passed.

H. S. POOLE.—I wish to call the attention of the society to the loss of one of our members while we have been in session. I would move that a letter of condolence be sent to the family of our late fellow member, John George Rutherford, whose untimely death has been reported. Associated as I was with him for some fourteen years, I would like to record his many excellent qualities, the care he gave to his work, and the respect he won from all classes with which he had to deal. His loss will be felt by the coal interests of the province.

The motion passed unanimously.

H. S. POOLE.—I move that a list be prepared of our practical miners and that a record be made of their experiences. I make this motion because not long ago my attention was called to the lack of a list that might be available for filling mining positions throughout the province.

R. KAULBACH.—I think it very important that we should have a list of men competent to take positions. Sometimes we are at a loss to find a man, and it is only after much enquiry we are able to get one. I endorse the suggestion very heartily and second the motion.

The motion passed unanimously.

ELECTION OF OFFICERS.

Officers for the ensuing year (1903-4) were elected as follows:—

President—Cornelius Shields, Sydney. *Vice Presidents*—Alexander McNeil, Halifax; C. A. Meissner, Sydney; Clarence H. Dimock, Windsor. *Council*—Alexander Dick, Charles J. Coll, Charles Archibald, David Baker, J. H. Austen, Hon. S. H. Holmes, F. H. Mason, A. A. Hayward, C. N. Crowe. *Secretary-Treasurer*—H. M. Wylde, Halifax. *Auditors*—C. C. Starr, R. H. Brown.

HON. R. DRUMMOND.—I move that the next half-yearly meeting of the society be held in Sydney.

A. MCNEIL seconded the motion which passed unanimously.

The meeting adjourned till the following morning.

The meeting opened on Friday, February 20th, at 10 o'clock, a. m., in the government's new building, with ex-President Stuart in the chair.

REPORT OF COMMITTEE ON ASSAY OFFICE, TECHNICAL EDUCATION, DEEP MINING, &c.

HON. R. DRUMMOND.—The committee on technical education and other matters, appointed at our last meeting, waited on the government and had an hour's conversation. We were obliged to the government for the time it spent with us, considering it was the day previous to the opening of the legislature.

One of the matters brought to the notice of the government was the establishment of an assay office. We were told that the subject was still under consideration. I am here to-day to give my own private opinion, as well as the opinion of the

committee, and I think that that is a diplomatic way of putting off the committee. I do not believe that the government realizes the seriousness of our request, and some measures should be taken to impress upon it that this society is really desirous that the government should establish an assay office.

The committee then brought up the matter of technical education. Premier Murray said he would have something further to say when Professor Kidner had furnished him with a report he had asked him for.

The subject of encouragement to deep mining was then taken up and was discussed with the government. The government said that encouragement to the gold mining industry was under consideration. That subject we can now eliminate from our list of grievances, as I noticed that the Lieutenant-Governor in his speech from the throne yesterday, said that particular attention would be devoted to gold mining, so that those engaged in that branch of industry may share more largely in the general activity and prosperity.

We then brought up the request for a better government mines report. But in its reply I think the government took a wise stand. It said it really desires to know what the society want. In conversation with Dr. E. Gilpin, inspector of mines, some time previously, he asked me, What does the Mining Society want? I replied, Perhaps some pictures, such as are published in the Canadian reports,—but I really was not in favor of it myself. Mr. Poole expressed his opinion that what was required was improved editing. If that was all we wanted, we should have stated so when the matter was brought up at first in this society. But I think you want more than that. The government said to us fairly, Put down in writing what you want in reference to the department of mines report and we will carry out your wishes. Nothing possibly can be fairer than that. I think the government is right in that respect and the society has been perhaps a little remiss.

The matter of improvement in surface mine plans was then spoken of. The Commissioner of Works and Mines explained that he was engaged in making new plans. He incidentally remarked that it would require a resurvey of the province, because some of the surveyors of that department had not taken notice of particular landmarks in their surveys, their maps being indefinite in that respect.

As to the matter of the deputy inspectors having a certificate, the government agreed with us.

The committee wants from the society this morning instructions in writing as to what is desired in regard to the department of mines reports. We have to go to the government with something in writing, so that it can definitely understand what we want.

CHAIRMAN STUART.—I think it would be well to define more fully what we desire, and reinstruct the committee so that it can go before the government with something definite.

HON. R. DRUMMOND.—As it might take too long for every member to express his views on the subject, I suggest that you appoint a committee with power to receive suggestions from any member of the society and then the committee could draw up a report embodying the views of the members.

THEFT OF GOLD.*

CHAIRMAN STUART.—I would like to impress upon the committee the great necessity of legislation on the question of gold stealing. It is one of the most important matters for the gold-mining industry. You will be surprised perhaps when I tell you that a large percentage of the Armenian peddlers who are going about the country, and the country is full of them, are offering gold in all forms for sale. In one week three Armenian

* See also p. 14.

peddlers offered a jeweller in Truro three different lots of gold in a retorted form. These were in large quantities too. I was sent for by the jeweller but had to tell him I was helpless. The only thing I could do was to notify all the managers of the mines in that section of the country. Although I have communicated with all the managers of gold mines in the eastern counties, nevertheless the peddlers are still offering gold for sale. These peddlers came from the Stormont district.

HON. R. DRUMMOND.—The Nova Scotian government can pass an act whereby no man can mill quartz to obtain gold without a license, then it is surely a simple matter for the government to attach a clause, whereby no man who has not a mill license shall sell unwrought gold in any form—quartz, gold or amalgam—without a license, and if he should do so he could be brought before a magistrate.

J. G. HUDSON.—If a man applies for a mill license, he has to get bondsmen; yet these Armenian pedlars can obtain this gold and go into the open market and sell it.

R. KAULBACH.—It seems to me there is a remarkable clause in the "mines act." The act defines what the conditions are with respect to mine owners and mill operators—that they must conform to certain things and pay royalty within a certain number of days; but at the foot of the act, it says, "except gold mortared by hand." That is where the whole trouble comes in. Any man can take gold into Halifax and sell it, and the mines department cannot molest him if it has been mortared by hand. The man I have referred to had all the appliances for mortaring gold. This man can bring it into Halifax and sell it without prohibition, the same as a bushel of wheat or oats. The government should amend the act, and I believe such an amendment would help the gold-mining industry of this country.

A. MCNEIL.—As a member of the executive of this society, I may tell you what our policy may likely be on this particular

question. With respect to the local legislature dealing with the subject of gold theft, there is a question of jurisdiction. For instance, the proposal of Hon. Mr. Drummond might or might not be considered within the legislative authority of the local parliament. There is no question of jurisdiction if you create a new crime or if you attempt to frame something with regard to criminal evidence, that must be dealt with by the Dominion parliament. There being a doubt, our executive would refer it to the Commissioner of Mines, who is one of our best lawyers, and also furnish him with a copy of the Westralian act, and ask him for similar legislation to be passed by the Dominion parliament if it be found that that is the right body to deal with it.

UNDERGROUND PLANS OF MINES.

CHAIRMAN STUART.—I would urge in the strongest possible way that the government make it compulsory for underground plans of gold mines to be kept. Of course it is impossible to get underground plans of old works, but it could be done with respect to future work. It is the simplest thing in the world to make these plans. It is merely a matter of measurement underground.

R. KAULBACH.—It is the law now that such plans be kept.

CHAIRMAN STUART.—Yes, but it is not enforced.

MINES' REPORTS.

CHAIRMAN STUART.—In regard to our request for an improved report of the department of mines of this province, I may say that when we before met the Commissioner of Mines, we simply placed in his hands a copy of the report of the Commissioner of Mines of British Columbia, which is very full. Of course it is true that there are a good many cuts of mines

and scenery in it, and I think we said to the Commissioner that we had no objection whatever to eliminating anything of that kind, although I believe cuts of a number of important mines are attractive and interesting; however, there is no particular value in them. What we want is more extended reports. Those now issued are very meagre, and have been up to the present time, except when Mr. Poole was Inspector of Mines, at which time they were very good indeed, and much more extensive. His reports were splendidly prepared, although he did not have the opportunity that we now have. There are now so many grammatical and typographical errors, etc., that they leave a bad impression. You would be astonished at the number of enquiries from abroad for our reports. In fact, it is the only thing that foreigners have to depend on as being absolutely reliable.

A. McNEIL.—Since I came into this society, there was nothing in its happenings that raised so much wrath and brought forth such fierce discussion as these mine reports. It was kept up in season and out of season, and yet the mines report came out year after year in the same form, with the same blue-book look on its face, and with the same thing inside. It seemed that the gentlemen who were making these complaints were serious, and it was decided to set them to work. A year or two ago a motion was made that everyone who took part in this agitation should be put on a committee, and that they should co-operate with the department of mines in bringing out an elaborate report that should contain all the information that they demanded. They were men of such ability, men of such information, men of such influence, entrusted with the discharge of these duties, that when the next mines report should come out we fully expected it to be such a report as would commend itself to the attention of the whole mining world. What do you suppose happened to the committee? It never met! Now, that is not the way to bring about reforms. We are engaged

in a serious business. When you take up such a question as this, you should take it up seriously and mean what you are talking about. If we are going to do anything, let us be in earnest about it. We have had a perfectly courteous and perfectly open invitation from the Commissioner of Mines to define what we want. The Commissioner is a man who I believe is gradually taking hold of the problems of the mining industry. If he were paid an adequate salary on which he could live by the mines department, he would do more towards carrying out the interests we have at heart. I do not see how the mining industry of this province can expect a man who was earning perhaps two or three times the salary paid the Commissioner of Mines, to take a position and give his whole time and attention to it for three thousand dollars a year. And if we are going on in this niggardly and half-hearted way, we have a very little idea of things in this country. It would take the whole time and attention of the best man we ever had to solve these questions—and yet we expect the Commissioner to get up an elaborate book and deal with all other questions. We must bear in mind that it takes the best men in the world to compile works of valuable information. Here is a work we are calling upon the Commissioner to compile, and yet we only pay him for half his time. You cannot expect him to do it.

CHAIRMAN STUART.—You must not charge us with the parsimonious part of it.

A. MCNEIL.—I do. We are all shareholders of the mining industry of this country. You cannot expect a government to be anything except what the people make it. I am never going to rail at the government. We can do what we like in this province; we can make it or unmake it, and I hope we will make it. That is the situation in regard to these mines reports. If we have men in this society who know what a good mines report ought to be, let them speak out.

If there is anybody in this society willing to take up this huge work of approaching the Commissioner of Mines and telling him what should go in the book, let him come forward and do it. There are some members who can give him the information. We will turn out the best mines report in the Dominion and one of the best in the world if the right men go to work. If we appoint men on a committee to assist the government in the prepartion of these reports, by all means let them go to work with industry and enthusiam. I would notcopy British Columbia. Some of the biggest "fake" business in the world came from that province. The whole mining industry was so inflated, that for a few years it almost killed the immense mining resources of that province. We never want to see such a state of affairs in Nova Scotia.

HON. R. DRUMMOND.—I am glad to hear Mr. McNeil's remarks. A number of years ago I was upbraiding at Premier Murray on these matters. The highest paid man in the government should be the Commissioner of Works and Mines. The best man should go there and get a good salary. No matter how good a man the Hon. Mr. Drysdale is, he should not be in the office unless he devote his whole time to it. And that is why I say he should have a salary to keep him, independent of his legal business. But to return to the department's reports. I had the privilege yesterday of seeing one of the reports. I have some idea of the printing business and it would drive me wild to have to correct one of these reports. There were numerous typographical and other errors in one page. What I suggested to Dr. Gilpin was this, adopt the Cumberland Railway and Coal Company's excellent system for obtaining their reports. The inspector should be given printed questions, monthly, to answer. Whatever information the department wants should be put in these printed forms and the inspectors should answer them. They should not write out a report, but merely answer the questions. I would rather

receive hints from correspondents than correct what they write. It would be better for Dr. Gilpin to have these replies to the department's questions and that he should write the report therefrom, for the inspectors are not competent to write departmental reports. It was not for that object they were first appointed. We are ready now for a better class of inspectors. We have had good inspectors, but we had no one in touch with the men, and the latter were afraid to report to the inspector for fear they should be victimized. There has been an educating influence at work for the past eighteen years, and men and managers are much better now.

CHAIRMAN STUART.—I am quite in accord with many of the remarks made by Mr. McNeil and by the Hon. Mr. Drummond. There have been errors in these reports that have been simply unpardonable. Take for instance the report for 1901. The largest district, that has produced three times as much gold as any other district in the province, is not mentioned at all, namely, Goldenville, and the two mines that are mentioned in Goldenville are credited to Harrigan Cove. Such errors are really inexcusable.

HON. R. DRUMMOND.—I would like to know from Mr. John Johnston, if the table of amount of air circulating in the coal mines each month, on page 17 of the report of the mines department for 1901, is sufficient.

J. JOHNSTON.—My own personal opinion is that it is not full enough. The reports of the mines departments of Illinois and Pennsylvania are excellent, and we would like to see ours modelled on the same lines. With respect to ventilation, a colliery at Sydney Mines, in the month of January, might have registered 150,000 to 200,000 feet of air. But people want to know something more than that. They want to know what that air is for. They know it is for ventilation. If an explosion takes place, they turn to the tables to see how much

air has been furnished—but they also want to know how many men, how many boys, and how many horses have been consuming the air. Ventilation is furnished for the purpose of enabling the miners to extract from the earth its mineral resources. Manual and animal labor must be protected by ventilation. The table should give the number of men and boys and horses that breathe this air, otherwise it is not complete. Then, again, the tables are not in a convenient place in the report. The amount of coal produced per man, per day, is not correct. The colliery that produces five tons of coal per man per day, need not complain of idleness nor drunkeness. There are few collieries that are producing five tons per man per day. It is not fair that the honest working man should be put down against a man who does not work half his time.

HON. R. DRUMMOND.—Look at page 29, where is given a table of dates of inspecting visits to mines.

J. JOHNSTON.—That is only information for the department. The inspector shows that he has made a visit to such a mine on such a date. That is only put there as a matter of convenience to the government.

R. H. BROWN.—I endorse everything that Mr. Johnson states. Ventilation is one of the most important things required in a colliery. At Sydney Mines we had an hourly record of every cubic foot of air that went into the mine. In England they say there should be five hundred feet of air per minute for each man. If an explosion occurs, the figures can be produced showing the number of men and the quantity of air they had to breathe. I think it is well that these records should be kept and that they should be published. I believe that the people take an interest in these things. Those tables could be extended very much. For instance, we should be told as regards each colliery, whether safety lamps or naked lamps are used, and the maker's name should also be furnished. At Sydney Mines

we introduced the English Marsaut lamp. At the time it was the best that could be obtained. Since then, possibly there may be something better. And even the kind of the oil used might be referred to. The oil we found best was procured in England.

J. JOHNSTON.—A great deal of credit is due to Mr. Brown and his company. He placed on his ventilating fan a locked pressure gauge, and any man could go into the fan house and see the pressure on this gauge at any time, and it could not possibly be tampered with except by the man who held the key. This may seem a trifling matter, but it is important. The mines act says there must be "adequate ventilation," but the word "adequate" covers a good deal.

On motion of A. MCNEIL, seconded by R. H. BROWN, Messrs. Stuart, Drummond and Poole were appointed a committee to act in conjunction with the Commissioner of Mines in getting out next year's report of the mines department.

On motion, Messrs. McNeil, Drummond and Poole were appointed a committee to take up the matter of technical education, the establishment of an assay office, and new mining plans, and to interview the government thereon.

MISCELLANEOUS BUSINESS.

HON. R. DRUMMOND.—I would like to refer to a matter that has been appearing in the Upper Provinces papers. It seems that we have a man in Canada who is far above anything that we have had in this province, and as we are more particularly interested in mining, perhaps with the exception of British Columbia, than any other province in the Dominion, I think we should claim part of the services of this expert. In the *Toronto Globe* and other papers, a number of reports of inspectors of mines point out

Dr. Haanel as a Canadian mining expert. There are a good many things we would like to know in Nova Scotia. I would like to know a great deal about our iron ore deposits. I move this resolution:—

"Resolved that the Minister of the Interior be respectfully requested to send to Nova Scotia at the earliest convenience, Dr. Haanel, the Superintendent of Mines, to examine and report on our mining practices, with a view to our profitably applying the ability and experience to which our attention has been called in the *Toronto Globe* and other newspapers by delineation and by description of the services rendered in the west of 'Canada's Mining Expert.'"

A. McNEIL seconded the motion which passed unanimously.

HON. R. DRUMMOND.—I move a vote of thanks to the retiring president, Mr. George W. Stuart, for the excellent manner in which he has filled the duties of his office.

A. McNEIL.—I wish to second the motion. When the history of the Mining Society of Nova Scotia comes to be written from its earliest period down to the time when the present incumbent took the chair, the work of that gentleman will be more fully appreciated. During the difficult and at times dangerous period through which the Mining Society has gone during the past three years, a period starting from almost the total collapse of the society up to now when it is emerging into a position of great influence and great power and great possibilities, we have had the untiring hand, the unselfish assistance of the gentleman who is just leaving the chair. That sort of voluntary work on behalf of one's own country, that sort of work which is given without fee, is a kind of effort which we as citizens should emulate, acknowledge and appreciate.

The motion passed unanimously.

On motion the following gentlemen were appointed a committee to arrange about the details of the meeting of the

society in Sydney during the coming summer: Alexander McNeil, chairman, T. J. Brown, Alexander Dick, J. L. Brass, Hon. R. Drummond, J. P. Edwards, James T. Burchill, George Stuart, W. L. Libbey, Joseph Quigley, Geoffry Morrow and H. M. Wylde.

HON. R. DRUMMOND.—I move that the executive of this society be empowered to enroll members at any time previous to the next half-yearly meeting, and that in the revision of the by-laws the enrollment of members be taken into consideration.

D. MCDONALD seconded the motion which passed unanimously.

ROYALTY ON IRON.

W. F. JENNISON.—I do not think it fair that an iron ore of 40 per cent. should pay the same royalty as one of 60 per cent. If 60 per cent. iron ore pays only 5 cents, the 40 per cent. ore is worth nothing as regards royalty. When you increase the impurities in iron ore, you not only lose the percentage of iron but have to handle the same quantity and use more fuel and flux, so that the cost is greatly added to. I also advocated something being done in the near future to test the iron deposits of the province.

CHAIRMAN STUART.—It is a very important question paying royalty on iron ore notwithstanding the unit. With respect to gold, two per cent. is paid on every dollar on a valuation of $19 an ounce. As a matter of fact it is not infrequent to have gold bullion that will only run from $14 to $17 an ounce. The gold in such cases may be obtained from close scrapings. I remember one occasion on which I had a bar of gold of 749 ounces that only gave $17 an ounce—the rest was silver and some copper, and yet I had to pay the gold royalty on a valuation of $19. I think it is quite a hardship in many cases.

W. F. JENNISON.—There is another matter I would like to refer to. Every right of search should be staked, and the corner stakes should be described in the application, so that the public could know exactly the ground taken up. In Newfoundland you have to stake out your property. In that colony you have to use a square stake four inches square and put in the ground 18 inches, or build a cairn around it 18 inches high, and have the post properly lettered.

The meeting adjourned.

ANNUAL DINNER.

The annual dinner of the society took place at the Halifax Hotel, on Thursday evening, February 19th.

MEETING, OCTOBER, 1903.

The semi-annual meeting of the society was held at the Provincial Science Library, Halifax, on Tuesday, the 27th October, 1903. The Vice-President, Alexander McNeil, took the chair at 11 a.m.

There were present—Alex. McNeil, director Port Hood Coal Co., Halifax; Alex. Dick, general sales agent Dominion Coal Co., Sydney; James Baid, manager Maritime Coal Co., Maccan; A. A. Hayward, Waverley; George W. Stuart, manager Nova Scotia and Mexican Mining Co., Goldenville; Hugh Fletcher, Geological Survey of Canada, Ottawa; C. N. Crowe, manager Dominion Antimony Co., West Gore; F. H. Mason, assayist, Halifax; Francis Burrows, manager Cumberland Coal and Railway Co.; G. L. Burritt, Halifax; G. J. Partington, manager Dolliver Mountain Mining and Milling Co., Isaac's Harbor; Harry Piers, curator Provincial Museum, Halifax; Dr. H. S. Poole, Halifax; R. A. C. McNally, Halifax; Charles Starr, Halifax; J. H. Austin, Halifax; John Rutherford, Halifax; F. P. Ronnan, editor "Industrial Advocate," Halifax; W. C. Milner, Halifax; Prof. Ernest Haycock, Acadia College, Wolfville; H. M. Wylde, Halifax; J. M. Geldert, Halifax; G. E. Francklyn, Halifax; B. C. Wilson, Waverley; D. C. Hood, Waverley; J. C. Taylor, New Glasgow; Hon. S. H. Holmes, Halifax; J. A. Johnson, Halifax; W. B. Ross, Halifax; F. W. Hanright, Halifax; T. R. Gue, Halifax; and M. R. Morrow, Halifax.

The minutes of the last meeting were read and confirmed.

The following candidates were elected members:—Francis Burrows, manager Joggins Mines, Joggins; Professor F. H. Sexton, Dalhousie College, Halifax.

(The names of members elected by the council since the last meeting, will be found on page 44.)

VICE-PRESIDENT'S ADDRESS.

VICE-PRESIDENT A. MCNEIL.—The following is a brief account of the society's work for the half-year:—

The annual meeting was held on the 19th and 20th February last. At that meeting it was decided to hold the semi-annual meeting at Sydney. A committee, of which I was named chairman, was appointed to carry out the details, and August 8th was named as a suitable date. In answer to the enquiries of our secretary, we ascertained that most of our members in Cape Breton favored postponing the meeting, and the members of the committee, when asked their opinion as to a postponement, generally thought that it would be better to have the meeting there next year. It seems that this was not a unanimous opinion, but the dissenting ones had probably not considered how awkward it is to go visiting when a divorce is about to take place in the family.

In the eight months that have elapsed since the annual meeting, the executive council of the society has met regularly once a month. I will give a brief summary of these monthly meetings.

In March, the question of legislation to prevent gold-stealing was taken up. A letter from the Minister of the Interior in relation to the society's resolution regarding Dr. Haanel's services was read, and the secretary was instructed to reply thereto. It was proposed to send a circular to members, asking for suggestions for improving the government mines report.

In April a report was made of the effort made through F. B. Wade, M. P., to get a gold-stealing act passed at this session of the Dominion parliament. A motion was adopted as follows: —"The council notes with much gratification the introduction into the Nova Scotian legislature of a government measure entitled 'An Act to Encourage Deep Mining in Nova Scotia.'" A copy of this resolution was ordered to be sent to the Commissioner of Mines.

In May, a committee, composed of Messrs. McNeil, Mason, Piers, and Wylde, was appointed to take up the question of collecting for the Provincial Exhibition a first-class mineral exhibit. That committee, through one of its members, interviewed the Commissioner of Mines, and as a result, the Curator of the Provincial Museum, Mr. Piers, was sent by the department to various districts in the province, and very successful work was done by him in securing an exhibit which, while necessarily not complete, was one that attracted a great deal of attention: and I have no hesitation in saying that it had an excellent effect in directing attention to the mineral resources of the province, especially some that are now little known. One of the most attractive features of this exhibit was the collection of building-stones and other such materials. In this connection reference should also be made to the publication prepared by Mr. Piers and issued by the government, giving a short description of the various economic mineral products of the province, and the amount of development done at the various mines reported. A large number of these useful pamphlets were distributed at the exhibition.

At the June meeting, the following were elected to membership of the society:—Messrs. P. H. Moore, Chester Basin; J. B. Forrest, Port Hood; and G. V. White, of the Dominion Iron and Steel Co., Sydney. Correspondence was read from F. B. Wade, M. P., regarding the gold-stealing legislation, which he hoped to have passed. It was also reported to the meeting that the local government was conferring, regarding deep mining, with E. R. Faribault, of the Geological Survey.

In July, the secretary announced that the members in the Sydney district favored a postponement of the meeting suggested for August 8th. The secretary was instructed to communicate with all interested, and get their views as to the advisability of holding the meeting later in the year. He was also instructed

to interview the Commissioner of Mines with a view to having someone collect samples for the Provincial Exhibition, as before referred to.

In September, it was decided to hold a meeting in Halifax on the last Tuesday in October. The following were elected members:—G. H. Gillespie, Ecum Secum: and John C. Taylor, New Glasgow. The secretary was instructed to write Dr. Bell acting director of the Geological Survey, with a view to getting Messrs. Fletcher and Faribault, of the Geological Survey, to attend the next meeting.

At the last meeting, it was decided to secure an act to incorporate the society. This has been done.

These, in brief, are the different matters taken up by the council.

MR. FARIBAULT'S REPORT ON DEEP MINING.

The Secretary read the following letter from W. L. Libbey, criticizing Mr. Faribault's report on the best methods of testing the value of the deeper gold deposits of Nova Scotia, in so far as it applied to the district in which Mr. Libbey is working:—

Boston, Oct. 22, 1903.

THE MINING SOCIETY OF NOVA SCOTIA.

The act of the last session of our Legislature, entitled, "An Act to encourage Deep Mining in the Gold Fields of Nova Scotia," has resulted already, among other things, in a report by E. R. Faribault, Civil Engineer, on the "Best methods of testing the value of the deeper Gold Deposits of Nova Scotia." The reading of this report, which came to my hand yesterday, suggests some possible criticisms.

I will not undertake discussion of Mr. Faribault's report on the portions of our gold fields to which he has been able to devote enough of his time to make an adequate survey and

examination of, as I feel that the warm expressions of commendation I have heard from numbers of our members familiar with the districts, give approval to his work.

His "Classified List of Gold Districts" is an important feature of a report, published by the government of Nova Scotia and presumably with its approval, which is likely to gain large circulation and to carry with it much weight. I desire therefore to call the attention of this society to a portion of the report on territory where I am personally cognizant of the means of information Mr. Faribault enjoyed, and the time employed in getting this information relating to an important industry.

Mr. Faribault drove from New Germany on a Saturday morning to Pleasant River Barrens and spent a portion of the day making an examination of a district in which every prospecting pit was filled with water. Thence to North Brookfield where he arrived about 4 p. m. At Brookfield he worked with only a few hours for eating and sleeping until about 2 p. m. on Sunday—*the next day*,—and during this time he was nearly *two hours* below ground. He left Brookfield and went to Molega. To avoid waste of time and get directly at the point, I submit that no man living could in this time gain information which would justify him in making a classification of a district.

Mr. Faribault's very definite conclusions as to whether or not the government of Nova Scotia may be allowed to aid any other class of deep mining than such as will tend to prove or disprove his saddle-vein theories, certainly open up an interesting field for discussion. I beg to be permitted to observe, however, that in my opinion the men who have money to invest in gold mining will be equally interested in the fact already proven, that gold is found at comparatively deep levels in fissure veins.

My own impression of the intention of the government of Nova Scotia in passing "An Act to encourage deep mining in

the Gold Fields of Nova Scotia," (and that impression is not yet modified by Mr. Faribault's report,) is that aid was intended to deep mining as a means to the extension and development of a probably important natural industry. The important commercial fact to demonstrate seems to me to be the existence of gold in such quantities and at such depth as to invite mining capital to invest in this province with a reasonable certainty of meeting such pecuniary rewards as have been met with in other countries. Capital does not care whether the gold exists in saddle veins or fissure veins; the question is, "Can the gold be mined at a profit?" Flippant opinions can only work harm; therefore, I make the motion that the government of Nova Scotia be respectfully requested to suppress such portions of E. R. Faribault's report as are not based on adequate examination of the districts referred to. I regret that my time for study of this report has been so limited and that I shall be unable to be present at the meeting, October 27th.

I am,

Yours most respectfully,

WILBUR L. LIBBEY.

G. J. PARTINGTON.—I think Mr. Libbey is not pleased at the limited time that Mr. Faribault spent in the western counties, forgetting that the latter's visit to the west was not for the purpose of making an exhaustive examination of various properties, but merely for the purpose of classifying the work that was being done in the different districts. The exposures of rock are very plain in the west, and Mr. Faribault went to places where work was being carried on, and ascertained how they were located with respect to the anticline. His visit, instead of being intended for the purpose of making an exhaustive examination, was only a rush trip to ascertain what part of the anticline they were working on, and into what class Mr. Libbey's mine should be put. A quick examination would put

him in possession of this information, and it was on this point alone that he went there. I think it due to Mr. Faribault to say this.

DR. H. S. POOLE.—If you will refer to Mr. Faribault's report, you will find that there is really no difference of opinion between him and Mr. Libbey, as to the classification of the mine at North Brookfield. Both speak of it as a fissure-vein. The only difference is, as to whether government aid should apply to Mr. Libbey's mine or not. That matter, however, was not left to Mr. Faribault to decide. He was asked to name districts which he thought would be typical of those containing saddle-veins, and the question to be determined was the probability of finding, in the saddles not visible on the surface, gold that would pay to mine. The question of the fissure-vein and its continuance in depth did not come before either this society or the local government, for the continuance of such veins and their auriferous character were not in doubt. Mr. Faribault, after many years of labor, and after collecting data with respect to mining operations in Australia, where anticlines are repeated at shorter distances than with us, came to the conclusion, not only that there would be a repetition of the surface structure as the mines were developed in depth, but that the succession of underlying veins would be found to be as large and as rich in gold as those cropping at the surface. It was practically to determine this that the society was anxious that the government should make a grant. If a mine paid on top, there was a prospect of its continuing to pay in depth within the limits of paying mining.

G. W. STUART.—I regret very much that Mr. Libbey has felt it his duty to censure Mr. Faribault, and the great work he has been doing for the province. There is no necessity for sinking test shafts to prove the value of fissure-veins. There is no question as to the value of such veins. Once get the pay-streak in them, and there is no difficulty in following it. What Mr. Faribault has endeavored to prove, and I think he has suc-

cessfully done so, is the probability that in this country our greatest value does not exist in fissure-veins, but in saddle-reefs, and he has endeavored to instruct us how to follow the pay-zone from one vein to another. This is one of the principal things we want to know to guide us in deep-mining. Unless we are able to follow the pay-zones from one lead to another, we will never have deep-mining in Nova Scotia. One of the illustrations which appear in the mining number of the *Nova Scotian*, laid on the table at this meeting, and for which great credit is due to Mr. W. C. Milner, shows at a glance what Mr. Faribault has been endeavouring to bring to our notice. If you will look at the illustration on page 27 of that paper, you will see the line of pay-zones, as determined by Mr. Faribault, extending from one lead to another, as the leads overlie each other. I think this is a most valuable thing to have in the mind of every man interested in gold mining in Nova Scotia, and I must pay Mr. Faribault a tribute from my own recent experience in Goldenville, Guysborough County. I started a year ago sinking a vertical shaft on the south side of the anticline beyond where any work had been done, and where I was told by old miners that I would not get gold. Nevertheless, I continued the work, and started the first cross-cut at a depth of one hundred and seventy feet. I had no one to support me, with the exception of Mr. Faribault. When the shaft was one hundred and sixty feet deep, he visited it, and reported to some of my company that I was right, and that I would cut the pay-zone within two hundred feet. Last week, at eighty feet from the shaft, in the cross-cut, I cut a fifteen feet belt, showing good values. Mr. Faribault was absolutely sure that by continuing that work I would strike the pay-zone, and I have done so. With the experience we have had in Goldenville, there is not the slightest difficulty in districts that have the anticlines as perfect as they are there, in following the gold zones

from one lead down to another. They have been able also to do so at the "Bluenose Mine" at Goldenville.

A. A. HAYWARD.—I look upon Mr. Faribault's work as theoretical. I am glad Mr. Stuart has struck gold, and I have every confidence in the future of deep-mining in Nova Scotia, and I may say I have had confidence in it for twenty years. Twenty years ago I tried to induce the government of the province to subsidize deep-mining, the question being whether gold can be found in paying quantities at greater depths than it has been found hitherto. At Salmon River mines, Halifax County, Mr. Faribault's theory was not demonstrated to be correct. There they sank four hundred feet and drove cross-cuts. As to the cost of doing the work, I am not informed. However, they were not successful in finding paying ore. Whether they would succeed or not at a greater depth, remains to be seen. The lines on the plan referred to by Mr. Stewart, showing the gold zones running down parallel to the axis of the anticline, are, I think, purely theoretical. The fact that Mr. Stuart has succeeded in finding rich gold in the manner stated by him, is no proof generally that auriferous ore lies in zones parallel to the axis of the anticline. I hope that the theory may prove to be correct; but whether it is or not, I believe that gold will be found at a greater depth, and I think no valid argument can be offered to show why the recurring underlying "saddles" should not be as rich in gold as those that overlie them. I believe that we have here one of the largest gold fields on the continent, and that gold will be found here at greater depths, perhaps, than in any other part of the continent.

G. J. PARTINGTON.—Now that Mr. Stuart has proved the existence of the gold zone in these leads or belts, he should give us a paper explaining on what theory he drove the cross-cut. Of course, we all start on theory, but Mr. Stuart certainly started on some well-defined plan of action.

DR. H. S. POOLE.—Mr. Hayward has referred to the experience at Salmon River as not bearing out Mr. Faribault's theory. Before accepting the experience there as conclusive, I would like to be assured that Mr. Faribault's recommendations or ideas were exactly carried out. Also, whether the percentage of gold obtained at Salmon River was not as large as that at at some other mines that are now being profitably worked?

A. A. HAYWARD.—The returns in the mines report are the best answer to that. The average was very low indeed.

VICE-PRESIDENT MCNEIL.—Should we not take into consideration the concentrates which are not in the returns?

A. A. HAYWARD.—They were also low in value.

G. J. PARTINGTON.—The mines report for 1902 shows seven dwts., one gr.

DR. H. S. POOLE.—That is a higher return than is got from some paying mines to-day.

G. W. STUART.—There was also a very large percentage of concentrates.

A. A. HAYWARD.—There is no question that the leads worked were auriferous, but they were not in paying quantities. It does not follow that what occurs in one mine will occur in another.

G. W. STUART.—I do not think that Mr. Faribault's instructions were carried out at Salmon River. The development work was too far west, and they got too far below the level of the paying zones.

VICE-PRESIDENT MCNEIL.—We all regret very much that Mr. Faribault was not able to be present to-day. We should have liked to have had him here to discuss the subject.

MINES DEPARTMENT REPORT.

DR. H. S. POOLE spoke for the committee on the mines department report.

After further discussion, the meeting approved of the appended communication being sent in response to the request of the Hon. Commissioner of Public Works and Mines:—

THE MINING SOCIETY.

HALIFAX, OCT. 30, 1903.

HON. A. DRYSDALE,
Commissioner of Works and Mines.

SIR,—The Mining Society having on several occasions expressed dissatisfaction with the annual reports of the Department of Mines, without affecting improvement in diction and in statements of fact, and having again referred to the matter, have been asked by you to particularize and show cause of complaint. We beg to reply as follows:—

We had refrained previously from detailing the short-comings of these reports, with a hope that a complaint in general terms would have been sufficiently stimulating to lead to more care being taken and to improvement being made in the following directions:—In editing the report; in accuracy of statement respecting operations; in accuracy in the tabular statements on the mineral industry.

While typographical errors are liable to occur even when care is exercised, such blemishes can be met by revision and a table of correction. Without such notes, confidence in the accuracy of these reports has been destroyed, as so many errors have been detected that many more are suspected to have been made. Thus the value of these reports is further depreciated, and the mining reputation of the province has been injured.

Accuracy is asked for as the primary essential; then, that a report be a record of what has been done in mining with sparing reference to what may be intended to be done; that it be written in good English; and the matter be systematically arranged under appropriate headings and subdivisions; distinguishing the several localities and mines by the *same* names throughout each report.

Then when these matters, which in most countries are regarded as the elementary essentials of an official report on any subject of public interest, have received attention, hope will be entertained by the Mining Society that matters of more extended interest will be added, as is done by other provinces of the Dominion.

Comment on the last report issued would be incomplete without earnest endorsement of the suggestion, page 38, of Mr. D'Arcy Weatherbe, respecting the enforcement of the law referring to the keeping of mine plans, and to ask. with him, why this matter, in spite of frequent complaints, has been for so many years neglected.

The attached slip contains samples of objectionable features taken from the Reports of 1900–1 and 1901–2.

All of which is respectfully submitted by the Mining Society in session on October 27th, 1903, by the hand of

Your humble and obedient servant,

H. M. WYLDE, *Secretary.*

The Mining Society submit the attached slip, with examples of objectionable features, taken from the Mines Report for 1900–1 :—

"Machinery which is on the ground and are ready."

"They are built of concrete and look fine."

"They are multitubular 5½ x 16′ "

"Due to the fact that the company takes all their coal run-of-mine, and don't require screens."

"The walls with steel sheets stamped to represent brick gives a neat appearance."

"A complete set are in course of erection."

"The size 13′ and 21′ x 36′ being compound steam corliss valve gear and compound air."

The mildly curious reader would like to be further instructed on "the coachway system" mentioned on page 13, the position of the new (?) "North Seam" at the Vale Colliery, and the new plant of 2200 h. p. boilers said to be there erected. Again, how "up-to-date 1170 boxes of stone and 750 feet of the slope has been made permanent?" Why "a foundation for a pair of 30 feet by 48 feet direct acting link receiving hoisting engines has been erected?" And how "the collection, exploitation and preservation of capital form the basis of industrial advancement?"

Some members of the society go so far as to desire that the indifferent use of the following be avoided:—

"Honourable" and "honorable." "Waverley" and "Waverly." "For the year ended," and "for the year ending." "The company are," and "the company is."

Fifteen mistakes have been detected on page xv. An error occurs somewhere in the fourth column on page xiv, and the table on that page makes the coal pits work 2518 days in the year.

The table on page xi is manifestly imperfect in several of the entries. Broad Cove is credited with producing but 56 tons in the year, while it is stated on page 26 there is an output of 100 tons per two shifts. Mabou is said to have produced 1028 tons with an engine consumption of 5 tons.

The table,, page ii, gives the names of only three of the mine agents, one of whom had ceased to be the representative when the report was compiled; while the names of all agents are filed with the department. In it some owners are mis-called.

The table on page xiv takes no note of the smaller coal mines —Jubilee, Strathcona, Scotia, Smith's Mine, Chignecto and Broad Cove.

The table on page xi also takes no note of the output of several of these smaller coal mines spoken of in the deputy's report— Jubilee, Strathcona, Smith's and Chignecto.

No reference is made to operations about the River Inhabitants, etc.

Turning now to the Mines Report for 1901-2, written since the renewed protest of this society, we find in it no improvement. Proof-reading has been as faulty as in its predecessors. It is, however, true, a glimmering of intention to correct errors is shown; one error is noted and has a whole page to itself. It might have been accompanied by many others, *e. g.*, "ors," "thirp," "wheelep," "laboa," etc. It might have substituted— "Survey" for "Society," "Intercolonial" for "International," "Constructed" for "concentrated," etc., and also have avoided the dual use of labor and labour; honor and honour; ended and ending; or the three variants, Thorborn, Thorburn and Thorburne.

In general "get up," many hints might be gotten from trade circulars, catalogues and school calendars.

Page 7 has a line on the drills, evidently adrift.

Page 8 speaks of the coal shipped to Quebec and the United States as "sales," while of that to Prince Edward Island as "exported."

Page 70, "Concentrated at the mine a coffer dam."

Page 9 speaks of extending a seam as though it could be stretched; and hopelessly to the uninitiated reader, mixes descriptions.

Page 10 gives undue prominence by head-lines to lamp houses, etc.; states that 2321 feet of level were driven during the year, which, if true, would be a record worth chronicling.

Page 11 tells of a fan 24 x 18 inches, which has a capacity of 200,000 cubic feet per minute,—but perhaps it is the house that has that size.

Page 12 gives to No. 3 Joggins an elaborate equipment it never possessed.

Page 13 leaves Cumberland county and goes to Pictou; page 15 returns to Cumberland, and page 17 reverts to Pictou, without mark or word to show it. Page 13 also gives the gratuitious information that there has been no surface improvement at a certain mine.

But enough has been commented on to show that throughout the report there will be found much that required the blue pencil of the editor.

The remarks already made on the tabular statements apply also to this report; and the table on page 88, which calls for the names of managers at the several mines, gives only three names, and one of the three wrong, while the insertion of at least twenty names might be suspected.

Page 18 speaks of smoke stacks with new features.

A. A. HAYWARD.—In dealing with the mines report, I feel that there will never be any improvement until there is a divorce in the office, and the mines department is separated from the department of public works, and a commissioner placed at the head of the first mentioned department, who will be a practical man, versed in mining, and who will have some progressive ideas as to the wants and necessities of the province.

F. P. RONNAN.—How far are the mine-owners to blame for defects in the information furnished to the department?

G. J. PARTINGTON.—The department has for some years past had one or two engineers employed in collecting information to be included in the blue book; but until the appointment of Mr. D. Weatherbe, I had only seen the inspector twice in twenty

years, whereas, since Mr. Weatherbe's appointment, I have seen him once every year. He has shown himself interested in the work, and he reports conditions as he sees them. He has been censured by some mine-owners for doing so, but I think all well-minded men will support him. If we had more like him, we would not have so much to complain of. With regard to particulars furnished, I do not think that the mine-owner is called upon to edit the book. It is true that plans have never been furnished, because they are not in the office, and they have never been there. The importance of it has never been brought home to the mine-owners. To-day, they have to file a plan of the mine, or they will get into trouble.

PLANS OF MINING PROPERTIES, Etc.

VICE-PRESIDENT MCNEIL. — There was a committee appointed in relation to the balance of the subjects referred to the Commissioner of Mines, and not dealt with according to the views of the society. There are three that are specially mentioned, viz., improved mining plans, the establishment of an assay office, and technical education. I presume the plans referred to are those mentioned in the report of the committee.

DR. H. S. POOLE.—No. I think those are general plans of the mineral districts. I understand that some new surveys and check measurements have been recently made, with a view to replacing some of the plans complained of. Part of Cumberland county has been covered more accurately than before. The gold districts have their plans and are bound by definite distances, while the coal, lead, and copper areas are subject to the option of each lessee.

VICE-PRESIDENT MCNEIL.—One difficulty in relation to applications for gold areas is, that bodies of water are not shown on the plans.

G. J. PARTINGTON.—There has never been a survey of a district with the object of indicating the surface features.

H. FLETCHER.—The question of cost has come up in connection with areas of coal companies. Coal companies which were desirous of having careful surveys, have had to pay for them themselves in whole or in part.

G. J. PARTINGTON.—The condition that prevails in the crown land department is disgraceful. One cannot get a plan of any district in any county of the province that is reliable. There is no continuity about them. If we could make them give us good plans, we would be satisfied. Where I have wanted natural features shown on the plans, I have sometimes had to give the necessary information myself to the department.

G. W. STUART.—In some cases, when I went to make application for crown lands, I found that the land was covered by a "blanket application" from some lumber company, which had been standing for years.

F. P. RONNAN.—It might be desirable to appoint a committee to make representations to the department on this subject in connection with others.

VICE-PRESIDENT MCNEIL.—I have heard much complaint about these plans, and occasionally hardship has been occasioned to men who have prospected on property that they thought they had a title to, until it was measured, and then they found that they had been misled. I think that the society should deal continuously with this subject until some solution is found. Someone has said that perhaps the province cannot afford to do this. I think that the province cannot afford to do without it. I suggest that the society consider the appointment of a special committee to deal with the subject.

J. BAIRD.—We are led astray in many districts by inaccurate surveys. A man may suppose from his plan that he has one thousand acres, when, as a matter of fact he may not have

one hundred. I think the only way out of the difficulty is to start with a clean sheet and make new plans, the established lines, of course, being held. I cannot see that it can be done in any other way. It is claimed that in some cases the difficulty about the lines is due to the variation of the compass; but it has been found in one place at Chignecto Mines that the compass reads the same to-day that it did twenty years ago.

A. A. HAYWARD.—This society has been in existence for eleven years, and we complain of aches and pains, but we do not get at the seat of the disease. We may keep on indefinitely appointing committees, but until the actual difficulty is got at, the result will always be the same.

G. J. PARTINGTON.—Would it not be better to do away with the use of the compass in making surveys?

H. FLETCHER.—Some faults in connection with the preparation of plans, result because the surveyor is told to hurry over the work and to spend on it as little time as possible. For this reason he omits to put down such a thing as the crossing of a brook, and where such particulars are not noted one can never tell with certainty where the line has been run. If the crossings of streams and other natural features were given on the plans, you would have something to refer to. As to the variation of the compass in the county of Cumberland, as Mr. Baird says, the variation is now that of the old lines, and the compass is at present where it was twenty or thirty years ago.

DR. H. S. POOLE.—I move that Mr. Partington associate with him such other members of the society as he may deem expedient, and draft a resolution to be submitted to the Commissioner of Mines, on the subject of surveys and plans of the mineral areas of the province.

G. W. STUART seconded the motion, which passed.

ADDRESS BY J. RUTHERFORD.

G. W. STUART.—I desire to call attention to the presence of Mr. John Rutherford, an honorary member of the society, and formerly inspector of mines for the province. I feel sure that our members would like to have a few words from him. Mr. Rutherford has been associated with the mining industry in this province ever since 1865, and no man present can express himself more intelligently on the subject.

J. RUTHERFORD.—I did not expect to be called upon to say anything in connection with matters before the society, and I feel some delicacy in making remarks until I have given more consideration to the subjects under discussion, especially in view of the fact that for sometime past I have been out of actual practice. As has been remarked, I have had a long experience in connection with mining in Nova Scotia, and some things have been mentioned this morning in which at a very early period I took a warm interest.

I have read Mr. Faribault's paper with much interest and pleasure, and I think that he has worked out a very satisfactory theory. Of course, I am aware that by further investigation only, can his ideas be verified; but I do think he is in the right direction.

Reference has been made to the necessity of better surveys of the mining districts of the province. That is a matter that impressed itself upon me when I first came to this country, and one of my earliest efforts as inspector of mines was to direct attention to the want of proper plans. At that time, of course, I was speaking more particularly with reference to plans of the coal mines; but it is easy to see that unless steps are taken to prevent it, a similar difficulty will occur with respect to the gold mines. Montagu was the first place where gold mining was carried on in a systematic manner, and I pointed out the importance of having the surveys there conducted properly; and I

also suggested that it would be advisable on the part of the government to appoint a surveyor for the special purpose of keeping up the plans and having copies of them on file in the mines office. There they would be open to the inspection of anyone beginning operations. In respect to coal mines, it was especially important that the bounds should be well defined, otherwise, if one starts in any locality and works towards the boundary, and other operators in the neighbourhood do the same, a connection may be made between the two properties, and great loss of life may result. I mentioned instances where such an unfortunate state of affairs had occurred in England, and was desirous that such occurrences should be avoided here. It seems extraordinary, at this late time, and in view of all you have done, that still no steps have been taken to have the surface properly laid out.

I thank you for the reference to me, and I am glad to be with you again. I miss many faces that I used to see here, but as I now live in town, I trust in future to be able to attend the meetings of the society more regularly and to renew the interest that I have always taken in mining matters in the province.

The meeting adjourned, and resumed at 2.30 p. m.

CUMBERLAND COAL BASIN AND THE GEOLOGICAL SURVEY.

HUGH FLETCHER, of the Geological Survey of Canada, exhibited maps of recent surveys of the Cumberland county coal basin, and addressed the society on the "Limits of the Workable Coals of the Cumberland Coal Fields in Nova Scotia." (Reproduced elsewhere).

J. A. JOHNSON.—We are all much indebted to Mr. Fletcher for giving us the benefit of his great knowledge of our coal fields. His work has been of immense advantage to Nova Scotia. When in connection with the bringing down of the

Dominion estimates I saw that there had been quite a reduction in the amount to be voted for the work of the Geological Survey, I wrote to some of the maritime members of parliament, stating that in my opinion, about all Nova Scotia got out of confederation, was the work of the geological survey. I cannot see what the Dominion government has done for Nova Scotia that we could not have done for ourselves, except the work accomplished by the survey. Notwithstanding the reduction of debt and increase of surpluses, it has been trying to hamper the survey by niggardliness in the amount appropriated for its support. I was glad to receive a letter from Mr. Logan, M. P., of Cumberland, in which he stated he had made representations to the Hon. Mr. Fielding and others, and that the vote would be brought back to the original amount in the supplementary estimates. I am sure Nova Scotia could afford to overbid the Dominion for Mr. Fletcher's services in this province, so that we would have the results of his work firsthand, and not have to depend upon the freaks of lithographers as to the time when the maps shall be published. Sometimes it has taken three or four years to get out a map that should be in the hands of the public in as many months.

I do not think that the government treats such men as Mr. Fletcher with the liberality that it should. If the cabinet ministers and members of parliament who sit in luxury at Ottawa and make laws for us, were to try to follow Mr. Fletcher through brush and mud in all sorts of weather for a month or less, I am sure that they would be willing to treat him with a much greater degree of liberality. The society should pass a resolution and forward it to the government at Ottawa, setting forth the great interest taken in Nova Scotia in the work of such men as Mr. Fletcher, and stating that in our opinion they should be liberally dealt with, and a larger appropriation made for the purpose of enabling them to carry on their work to greater advantage.

A. DICK.—I agree with what Mr. Johnson has said about this important matter. After having been in British Columbia, I have sometimes thought that the east is overshadowed by the west in matters connected with the Geological Survey. I remember at one time when we were in great need of accurate plans in the Kootenays and representations were made to the department at Ottawa, geologists were sent out at once and preliminary plans issued within twelve months after the surveys were made. I cannot understand why it is that in this province where we have vast resources unexplored, and upon which a great deal of work should be done by the department, a more generous policy is not pursued, unless it be that we do not represent our case in the strenuous way that the people in the west do. In the west these matters are looked upon as of great importance, while in this province we appear to let them go by default, with the result that the department has sent down Mr. Fletcher year after year, but allows his plans and other work to remain unpublished. We should make a point of asking the government to give us promptly reports of Mr. Fletcher's work. When his reports are submitted and edited, we do not know how much may have been cut out of them. I cannot understand why it should be necessary to revise at all a report made by such a man as Mr. Fletcher, after he has made a complete survey of a territory. I agree that representations should be made by the society, and I feel that we have been too lax in not pressing this matter in the past.

HON. S. H. HOLMES.—I am sure that the people of Nova Scotia are much indebted to Mr. Fletcher for the attention that he has given to matters that concern us more intimately than they do the people of any other portion of the Dominion. The information he has to-day given to the society shows the probability of the existence of a large field of future wealth in Nova Scotia, and the province should see that effective measures are taken to have the work completed and published promptly. The Dominion government is doing a great deal in this direction

but it has a large field to go over, and each part of it has equal claims. When we look at this matter, we must ask ourselves the question, who is to be benefitted by the discovery of new deposits of coal in Nova Scotia? Not the Dominion government, but the government of the province, for the latter will receive all the royalties from the coals contained in any new fields. While I agree with Mr. Johnson that it is important that these elements of wealth should be explored and developed, there is the question whether the local government is doing its whole duty in the matter. We should be thankful for what the Dominion government does, but we should call upon the local government to do its share, for it is the body which will receive the benefit. I think it has been lax, ever since we have been a province of the Dominion, in not sufficiently exploring our mineral resources.

F. W. HANRIGHT.—I wish to add a word of appreciation of the work that Mr. Fletcher is doing. I have had occasion to call upon him for information a number of times, and have always found him willing to give the benefit of his painstaking and careful work in the Cumberland field. In the work that I am doing there in opening coal areas, I am relying upon the skill of Mr. Fletcher. I feel, like others, that it would be of great advantage to people who are engaged in the mining business and who propose to expend money in opening up areas, if they had the plans which are the result of the painstaking study of Mr. Fletcher, at an earlier period than they have been able to obtain them heretofore. While not in a position to enter into a criticism of this map, I wish to express my gratitude to Mr. Fletcher for his extreme courtesy, and to mention that his work, as far as I have followed it, has given the greatest satisfaction.

H. FLETCHER.—If I may be permitted, I would like to say that so far as the maps of the north-eastern portion of Cumberland county are concerned, it is not the fault of the department that they are not issued, but it is owing to my own

slowness of comprehension. Only one of the sheets I have shown you is nearly ready for publication. The other four sheets before you were, unfortunately, traced and prepared by the draughtsman of the department, under a misapprehension, that they were ready. The plot of a large portion of the country, from Little Shulee south to Minas Basin near Port Greville, should be ready in a few weeks, but the sheets in the north-east corner may be delayed until spring.

A. DICK.—What would it cost to lithograph these maps ?

H. FLETCHER.—I hardly know. Dr. Poole had an offer to publish his map of the Pictou coal fields, 22 x 45 inches, in an edition of 3,000 copies, in eight colors, for $500.

A. DICK.—Would it cost $1,000 ?

H. FLETCHER.—Perhaps. Certainly more than $500 to the government.

J. A. JOHNSON.—I move the following resolution :—

Whereas the Geological Survey at Ottawa has year after year sent members of the geological staff to investigate the geological formations of Nova Scotia, and particularly of late those in connection with the coal fields in Cumberland county ;

And Whereas, in the past, reports accompanied by maps have been furnished to the department, but the publication has been delayed ;

Therefore Resolved, That the Mining Society of Nova Scotia, at this, its semi-annual meeting, memorialize the government that at the earliest possible date it supply these maps to the public.

A. DICK seconded the motion, which passed.

DR. H. S. POOLE read a paper entitled "A Trip to West Virginia." (Reproduced elsewhere.)

MINING EDITION OF THE "NOVA SCOTIAN."

VICE-PRESIDENT MCNEIL.—Reference has been made to the special mining edition of the *Nova Scotian*, advance copies of which have been laid upon the table. I think it only right that we should make some special reference to this work, which, in my opinion, is one of the more important works of the kind attempted in this province. It doubtless will prove of great value to the mining industry, as the distribution provided for is very large. I think the society should show its appreciation of a work of this kind.

G. W. STUART.—I move a vote of thanks to the gentlemen who have issued the interesting mining edition of the *Nova Scotian*. I understand that Mr. B. F. Pearson bears the entire expense of it. I think it is a most laudable act on his part, and I move the following resolution:—Resolved, that this society appreciates the efforts of Mr. B. F. Pearson in issuing such an attractive, interesting and valuable edition of the *Nova Scotian*, and desires to thank Messrs. Pearson and Milner for the advance sheets laid upon the table, and so frequently referred to at this meeting.

C. C. STARR seconded the motion, which passed.

MINERAL EXHIBIT AT PROVINCIAL EXHIBITION.

This matter was taken up and suggestions called for, with a view to the improvement of the exhibit.

H. PIERS.—Better accommodation is needed for the collection, and I think it could easily be obtained. This will be a permanent exhibit, and I understand that the government will add to it each year. This being the case, the exhibit should be placed on the ground floor, and should be given more space for purposes of display.

DR. H. S. POOLE.—I saw the collection at the exhibition, and thought it was very creditable to the province. The trouble with the collections which have been made from time to time, is that the better specimens are picked out and made part of exhibits which are sent to other places, and, with few exceptions, retained, so that the work has to be done all over again. It is often the case that a specimen is unique, and it is therefore undesirable that a typical specimen should be allowed to leave the province. The exhibition commissioners should now be asked to lend their assistance towards the establishment of a permanent exhibit on the grounds. What we want is a permanent building in which stones of no intrinsic value can be kept from year to year and added to from time to time as those interested in the collection are able to supply them. It might be said that these samples could be boxed up and got out when required; but handling stones and rubbing them together spoils their appearance and gives them a worn look and detracts from their value.

F. P. RONNAN.—There is a building which has been given up to a fisheries exhibit, but which has not been appreciated much, judging from the number and character of the exhibits. Could it not be obtained for the mineral exhibit?

J. A. JOHNSON.—I expect to appear before the exhibition commission before long, and will bring the matter up. I think it is of great importance. If you try to induce people to go into a building that is not well lighted and ventilated, they will not go. With fish and minerals properly housed and displayed, we should be able to have two splendid exhibits. There should be a suitable building for the minerals, and it should be an artistic building, beautiful on the outside as in the interior, and I will do my best to impress it upon the commission from this point. It would be a pity not to have this magnificent collection kept intact.

A. DICK.—In connection with the coal exhibit a year ago, we went to considerable trouble and expense to get out a large block of coal and send it to Halifax for the purposes of the exhibition. It is rather an expensive piece of work to take out such a large piece of coal and bring it here intact. This year we were asked to do the same thing, but we objected. We thought we had gone to sufficient expense last year, and that the exhibit was here. If you attempt to move such specimens, they will, of course, be broken up. They should last for three or four years. The exhibit made by the Dominion Iron and Steel Co. in 1902 should have been kept intact. It cost $600 to put it here. It is all a question of having a permanent building.

F. P. RONNAN.—It might be worth while to ask what steps are being taken by the government to place an exhibit of our minerals and building-stones at the St. Louis fair. The fair is to be held in a district that we should pay a great deal of attention to.

H. PIERS.—The exhibition branch of the Dominion agricultural department has a man at present collecting for the St. Louis exhibition. If the collection at Halifax is used, it should be returned to Halifax. Any permanent exhibit shown at the Nova Scotia Provincial Exhibition should be displayed on the ground floor. It is more necessary to have a permanent building for minerals, than it is for most other exhibits, because when the minerals are once placed in position, they can so remain from one year to another.

VICE-PRESIDENT MCNEIL.—One or two members of the society might accompany Mr. Johnson before the commission.

DR. H. S. POOLE.—I move, that whereas, in the opinion of this society, the time has arrived when there should be a suitable building erected for the display and permanent mainten-

ance of specimens of the economic mineral products of the province; therefore resolved, that the provincial exhibition commission be requested to carry out this suggestion.

F. P. RONNAN seconded the resolution, which passed.

DR. H. S. POOLE.—I move that the thanks of the society be extended to the Commissioner of Mines for the assistance given by him towards the collection of the mineral exhibit.

J. A. JOHNSON seconded the motion, which passed.

The meeting adjourned.

PAPERS.

On the Corrosive Action of Boiler-Feed Waters.

By Francis H. Mason, F.C.S.

(Read 19th February, 1903.)

In treating the subject of boiler-feed waters, I propose dealing more particularly with waters that have a direct solvent, or perhaps I should say corrosive, action upon iron and steel, and not with those waters that carry mineral salts in solution, which become precipitated either at the normal boiling point, or at a higher temperature due to increased pressure in the boiler. This latter kind of feed-water, producing what is known as incrustation or boiler crock, has been investigated by a number of able observers, and their views upon the subject are to be found in the journals of many of our learned societies. Feed-waters having a corrosive action upon iron, may be treated under three heads, and with certain notable exceptions are derived from three sources:

1. That which particularly interests us in Nova Scotia is what I propose calling swamp water, by which I mean water derived from swamps or shallow lakes, the water-shed of which is largely uncultivated land. The deleterious matter in this water is vegetable organic matter, not necessarily of an acid nature.

2. Well water, the deleterious matter in which is dissolved salts, generally salts of the halogens or of sulphuric oxide. It also frequently contains carbonic acid, given off on boiling, and carbonates.

3. Mine water, which often contains sulphates and basic sulphates of the iron group, and sometimes free sulphuric acid. Mine water is liable to contain dissolved salts as in well water.

Swamp water derives its vegetable matter from dead and decaying matter; and also to no small extent from living vegetable matter.

A careful study of Halifax city water, extended over a considerable period, shows that the vegetable matter, as determined by Tidy's modification of Forschammer process, is least in summer and late in winter, and most in early spring and late autumn.

The action of sunlight will undoubtedly account for the decrease in summer, and the frozen ground and decreased amount of surface percolation may to some extent account for the winter decrease. I think the increase in early spring and late autumn, is largely owing to the sap being in the roots of the undergrowth at that time of year, and its being more readily given up to the water percolating around them.

It has been generally supposed that the action of vegetable waters upon iron is due to the organic acids contained in them. This I have distinctly proved is not necessarily the case, although to exactly what the corrosion is due, I have not yet discovered.

It is, however, certain that in the presence of very appreciable quantities of vegetable matter in the feed-water, iron rapidly becomes corroded, whether the water be acid, alkaline, or neutral. I have carried out a number of experiments with a view to finding a remedy. Working on Halifax water when it was giving an oxygen absorption of from 0.5 to 0.6 parts per 100,000, by the permanganate process, (an absorption which by the way classes it as a water unfit for drinking), I have obtained some exceedingly interesting results.

My first object was to find out the amount of iron dissolved by a given weight of water. The method I employed consisted of taking a known weight of iron in the form of clean, soft wire, and imitating the mountings of the boiler by a piece of brass wire intertwisted with the iron wire for a small part of its length. The wires were then immersed in a big flask in which 5 litres of water were evaporated down to 200 cubic centimetres. The wire was then taken out, washed in distilled water, carefully wiped to remove oxide, again washed in distilled water, and finally in alcohol, then dried for a few minutes at 100° c., and

weighed. I endeavored to make all the experiments as analagous as possible. Approximately the same weight of wire was taken in each case, and it was in contact with the water for as nearly as possible the same length of time.

The results which I am going to give you are typical experiments. I have chosen this method in preference to giving the mean of a number of experiments, because, 1st, the variation is slight; 2nd, the oxygen absorption varied slightly when the experiments were made; and as I have not yet been able to discover a direct ratio between the oxygen absorbed and the amount of iron going into solution, it was impossible to adjust the one to the other.

Before proceeding further, I wish to raise a protest against the stereotyped method of determining the oxygen absorption. It consists, as many of you are aware, of subjecting a given quality of water, acidulated with sulphuric acid, to the action of permanganate of potash at a temperature of 80° F., for periods of fifteen minutes and four hours respectively. These periods of time were laid down by the water committee of the Society of Public Analysts of Great Britain and Ireland, and they probably fulfilled their requirements. It has been adopted by the public analysts of the Dominion, for whom I contend it is far from satisfactory.

In a number of waters that have been submitted to me for analyses, I have found that the oxygen absorption goes on in some instances for a period of twenty-four hours; and I contend that the object to be arrived at is the total absorption, rather than that taking place in a given time. My own practice is to run a check with distilled water, side by side with the water under examination, and to carry the absorption to practical completion.

My first experiment was to find the amount of iron dissolved. 1 decigramme of iron wire was placed in a flask with 2 litres of Halifax water, the mouth of the flask was covered, with the exception of just sufficient space to allow the steam to come away, 3

more litres of water were added as that in the flask boiled away, and evaporated to 200 cubic centimeters. At the termination of the experiment the iron weighed 933 decigrammes, showing a loss of 7.7 milligrammes, or 0.154 parts per 100,000 parts of water. If we take a 100 h. p. boiler evaporating 75 pounds per h. p. per hour in a working day of 24 hours, Halifax water is capable of consuming .2618 pounds of iron, or to put it roughly, a quarter of a pound. This in itself might not perhaps be such a very considerable item if the corrosion were uniform, but it is not. As the water boiled away in the flask, brown spots appeared at irregular intervals on the iron wire. These grew larger as the water continued to boil away, and towards the end of the experiment the wire was corroded completely through at some of these points, so that the iron which was introduced in one coil, was taken out in five pieces, having been completely corroded through in four places.

Viewed under the microscope, the wire was found to be badly pitted in places, while in others it appeared to be as clean as when it was placed in the flask.

I have reproduced some photographs, which I regret to say are not as good as I should have wished. I was unable to borrow a microscope with a photographic attachment, and these photographs have been produced by adapting my hand camera to my microscope, an arrangement which rendered proper focusing particularly difficult. The matter which grew upon the iron wire, viewed under the microscope, had every appearance of bog iron ore. The three high-power (30 diams.) photographs show pitting, the low-power (8 diams.) one illustrates the mode of attack and shows the hydrate of iron attached to the wire.

Having clearly proved by a number of experiments that Halifax water had a corrosive action on iron, I set about to try and find a remedy. Halifax water at this time showed a distinctly acid reaction with phenolphthalein, and thinking this the probable cause of its corrosive action, the foregoing experi-

ment was repeated, the water having 7.2 cc. of centinormal soda solution added to it, the amount required to neutralize it. The brown "fungus" appeared as before, only to a more marked extent, and the iron wire began breaking earlier in the experiment. At the end of the experiment, the wire had lost 1.32 centigrammes, considerably more than in the experiment with the plain water. This clearly showed the cause was not due to acidity, as the residual water gave a faintly alkaline reaction. It occurred to me that it might be possible to break up the organic matter with permanganate of potash. The exact amount demanded by the oxygen absorption test was added, and the experiment again repeated. In this case no brown "fungus" appeared. There was a slight discoloration along the whole length of the wire which remained intact until the end of the experiment. On weighing, it was found to have lost 4 millegrammes, almost halving the loss with plain water. Unfortunately for the success of this as a remedy, hydrated dioxide of manganese was formed, which adhered most tenaciously to the flask, and threatened to form a most refractory boiler crock.

From the amount of permanganate demanded by the oxygen absorption test, I calculated the amount of bichromate of potash required, and again repeated the experiment. The iron wire remained clean and bright throughout the whole experiment. It was found on weighing to have lost 1.8 millegrammes, not quite one quarter of what the plain water corroded away. The residual water was placed in a stoppered bottle and the undecomposed bichromate determined by adding potassium iodide and sulphuric acid, heating, and when cool, the liberated iodine was titrated with this sulphate of soda, and the amount of undecomposed bichromate calculated. The water was found to have decomposed only 11.86 per cent. of the bichromate added.

The exact amount of bichromate (7.35 millegrams) demanded by the previous experiment was added to the water, and the experiment again repeated. The wire remained clean and bright

as before, and upon weighing at the termination of the experiment, was found to weigh 0.1 millegrammes more than when it was put in. Viewed under the microscope it was as clean and bright as before the experiment. The very slight increase in weight was undoubtedly due to oxidation, but so slight that it could not be detected by the microscope.

The amount of bichromate required for 100,000 parts of water was .1571 parts, or to take the 100 h. p. boiler under the same conditions previously mentioned, 0.267 pounds per day, which at eight and a quarter cents a pound, would give a cost of 2.2 cents per day.

So far as Halifax city water is concerned, the addition of small quantities of bichromate of potash will be found to prevent the corrosive action upon iron, and I see no reason why it should not be equally effective with other waters high in vegetable matter, at any rate with those that obtain their vegetable matter from a similar source.

There is nothing formed to cause a boiler crock. It is cheap and in every sense it appears to be a desirable remedy. Exactly what chemical reactions take place I have not discovered, except that the action is one of oxidation. The total solids in Halifax water only amount to from 3 to 4 parts per 100,000, of which from 50 to 60 per cent. is organic matter, so that a very large quantity of water has to be evaporated to obtain a sufficient amount of material with which to work.

From the amount of undecomposed bichromate at the end of experiments in which the exact amount demanded by the oxygen absorption test had been used, it is evident that only a small proportion of the organic matter had been oxidized. The residual 200 cc., too, appeared to be as thick and muddy with organic matter when the bichromate was added, as when the plain water was evaporated.

Previous methods of treating waters high in vegetable matter have, to the best of my knowledge, for the most part been

carried out before feeding the waters into the boilers. They may be briefly reviewed as follows:—

Filtrations through limestone chippings, the filter being intermittent. This method was devised, I believe, by Sir W. Crooks. The object of the intermittent filter is increased areation. The process answered well, but considerable difficulty was experienced in keeping the limestone active. It was found that after a short time the latter became slimed, and had no further action. Subsequently a layer of sharp sand on the top of the limestone chippings was found to considerably increase the life of the filter. It appears to me that with certain waters a considerable quantity of lime might be taken up in an unstable state of combination which might subsequently form a refractory incrustation in the boiler. Adding carbonate of lime in solution as bicarbonate and precipitating with milk of lime, a method due to Dr. Percy Frankland, has been found to precipitate the organic matters with the carbonate of lime, which is allowed to settle, and the water, removed by decantation or filtration, is in an excellent condition for both economic and industrial purposes.

Slow percolation through spongy iron or iron borings is another method which has met with some success, and it will be at once evident that its object is to satisfy the water with iron before it enters the boiler. Suspending zinc plates in the boiler has been recommended, and its use at times has been attended with only partial success.

Since making my own experiments, I find in the last issue of the *Chemical Society's Journal* a short notice of the process in which permanganate of lime is used and the excess of the reagent removed with iron, but no details or results are given.

When the water is being treated for boiler purposes only, I consider the bichromate process has a considerable advantage by virtue of its simplicity and cheapness, and also that a very considerable excess of the reagent, while not so good as the proper

amount, is still infinitely better than using the water in its original state.

It would be necessary in the first place to submit the water to a chemist to find the proper quantity of bichromate to be used, after which, provided care is taken to see that there is always a small excess of the reagent present, (a simple method could be devised that the engineer in charge could rapidly learn,) there should be no further necessity for a chemist's assistance. The most convenient method of adding the reagent would be to make up a stock solution, the strength of which could have some simple ratio in pints to the amount of water used per day.

I now come to well waters, and while I have nothing original to give you on this class of water, I thought that it would make this paper more complete if I briefly reviewed some of the researches of other workers. The dissolved solids most frequently met with in well waters consist of calcium and magnesium, in combination with carbonic and sulphuric acid and chlorine, sodium and potassium in combination with sulphuric acid and chlorine, and less frequently iron and aluminum as chlorides and sulphates. Other elements either exist in such minute quantities or are so rarely present in water that they hardly come within the scope of this paper.

I will deal with these salts separately. Carbonate of lime held in solution in carbonic acid is precipitated at and below the normal boiling point with evolution of carbonic acid. Moist carbonic acid is an active corrosive upon iron, while the precipitated carbonate forms boiler incrustation. By far the most satisfactory method of removing both the carbonate and free carbonic acid is Clark's process. This consists of adding milk of lime, in the exact proportion to neutralize the whole of the free carbonic acid, and thoroughly incorporating the two by stirring, when both the added lime and that in solution as bi-carbonate becomes precipitated as carbonate. The precipitate is then

allowed to subside and the water drawn off, or the water may be freed from the carbonate by forcing it through filter cloths.

Sulphate of lime has only a slight corrosive action on iron. At the temperature of the boiler the sulphate, which is dissolved as a hydrated sulphate, loses its water and becomes precipitated as an almost anhydrous salt forming boiler incrustation. It may be removed by the addition of the necessary proportions of hydrate or carbonic soda or potash, together with the application of heat, the lime being precipitated as carbonate, leaving sulphate of soda or potash in solution.

Calcium chloride, according to Ost, has a marked corrosive action upon iron, coating it with black magnetic oxide. No iron passes into solution. There is practically no remedy except distillation known for water containing large amounts of this salt. The calcium could be replaced by sodium or potassium, but the chloride of these two metals act similarly to chloride of calcium.

The salts of magnesium are amongst the worst enemies to users of boilers. The carbonate, which is generally associated with carbonate of lime, forms a most tenacious incrustation. It may be removed in the same way and at the same time as the carbonate of lime, only it is necessary to add caustic soda or potash with the milk of lime.

The sulphate and chloride of magnesium both form coatings of magnetic oxide of iron on the boiler plate, the irons passing into solution. In the case of the chloride, Wagner claimed some years ago, and it had been generally accepted, that in the high temperatures of the boiler it was broken up into hydrochloric acid and oxychloride of magnesium. Recent researches of Hermann Ost go to show that such is not the case, but that a reversible reaction takes place which may be expressed by the equation, $Mg\,Cl_2 + Fe\,O \rightleftharpoons Fe\,Cl_2 + Mg\,O$.

Magnesium salts are dangerous in boiler waters, and as they can be removed by hydrate or carbonate of soda and heat, it is always safer to replace them by the far less injurious soda salts.

Chlorides and sulphates of the fixed alkalies form a coating of magnetic oxide of iron, and can only be removed by distillation.

Besides, any of the foregoing salts found in deep well waters, mine waters may contain sulphates of the iron group and free sulphuric acid. Sulphates and chlorides of iron, especially when in the ferric state are highly dangerous in boilers, becoming reduced to the ferrous state at the expense of the boiler plate, and when in the ferrous state to basic and oxy salts, also at the cost of the boiler plate. When it is necessary that such waters should be used, the iron should be replaced by the far less noxious soda salts, by the addition of carbonate of soda.

The sulphate and chloride of aluminium behave like those of magnesium, and may be removed in the same way.

All these processes of rectifying water should take place before the water is fed into the boiler. It is impossible to lay down any hard and fast rules with regard to how much of any one of the foregoing salts is allowable in a boiler water. The injurious effects of the presence of one salt are often neutralized by the existence of another. Thus, for instance, with waters containing magnesium chloride, Hermann Ost found that if the water contains two parts of carbonate of lime for every five parts of magnesium chloride no appreciable action takes place, when working under a pressure of five atmospheres.

Again, a fairly hard or scale-producing water may contain much more organic matter, without injurious effects, than a soft water, the scale forming a protective coating on the iron and preventing the attack of the organic matter. The pressure under which the water is to be used must be taken into consideration in choosing a boiler water. A water which is suited for a low pressure may often be altogether unsuited for a high pressure boiler.

Just a few words in conclusion in condemnation of the haphazard use of boiler compounds. It is absurd upon the face of it to suppose that any one remedy is going to be a universal

panacea for the ills of all boiler waters. The disease must be diagnosed and then the remedy can be applied, and this will be found to be infinitely cheaper and more satisfactory in the end, than piling into the boiler a quantity of unwholesome nostrums masquerading under the name of boiler compounds, which seldom do any good and often produce considerable harm.

I may possibly be accused of mixing up the metric and avoirdupois systems of weights and measures in this paper. The experiments were carried out as is usual in laboratory work in the metric system. As many of you may not be familiar with that system, those weights and measures which I particularly wanted to impress upon you have been converted into the English system.

DISCUSSION.

DR. A. H. MACKAY.—The material affecting boiler water to the extent sometimes of causing it to have a very bad odor, is probably organic matter undergoing putrefaction. I would hardly expect the oxidation of this matter to cause any injury. On the contrary, I am under the impression it would have the effect of reducing the injury.

Some Aspects of Technical Education.

By T. B. KIDNER, Prov. Supervisor of Manual Training, Truro, N. S.

(Read 19th February, 1903.)

The question of technical education being such a complex one, and so many attempts having been made to solve its problems, as viewed from different standpoints, a consideration of some of its many aspects may be of interest at the present juncture.

While the necessity for technical education seems to be generally admitted, there is great diversity of opinion as to the best method of applying this remedy for the present state of affairs; that is, if we are to judge from the widely different methods adopted or recommended by its advocates. The scope of technical education is so broad and its aims so numerous, that this divergence is quite natural, and the apparent confliction of thought is simply due to the many phases of the question which present themselves.

There are those who hold that the training of the leaders, the "Captains of Industry," is all important in these days of machinery and minute sub-division of labour.

Others maintain that the training of foremen and managers of departments is the greatest necessity, and some of the most celebrated of the European schools of technology are planned solely with this in view.

Another school of thought insists that the higher training of the leaders is of little use unless the workmen themselves are educated in the scientific and theoretical principles underlying their trades or occupations.

Others again, and these an increasing number in many countries to-day, are of opinion that no system of technical education can succeed unless some radical changes are made in the methods and subjects of education in the primary schools.

They would, therefore, commence their innovations there, and thus provide (in their opinion) a good foundation for the superstructure of specialized technical training later on.

As with most questions, all these divergent views and theories may be quite sound and all of the methods advocated necessary, but so much depends upon the point of view. Again, there are no two trades or industries wholly alike in their conditions, and the form of technical education adapted to one may be wholly unsuited to the other. At the Congress on Technical Education, held in London in the summer of 1897, and attended by most of the leading scientists and educators of the world, Prof. Sylvanus Thompson put this very clearly. He said :—

"Technical education means a different thing in every trade, or group of trades. Take the following cases :—In certain handicraft industries, such as that of the zinc worker, every man must be a skilled workman. Besides a large amount of experience to be gained only in the craft itself, he needs a certain knowledge of geometry of a particular kind. He must know something about the properties of metals, about soldering, about corrosion and its prevention.

"The acquisition of this knowledge does not necessitate many years of study, nor compel attendance in any very expensive laboratory; but every man must get something of this training. Take, by way of contrast, the technical training required in one of the chemical industries, such as that of the manufacture of dyestuffs. The work in this industry is carried out by a few highly trained chemists, an engineer or two, and a large number of unskilled labourers. The industry in no way depends upon the training of the labourers. It would not be benefited to any perceptible degree by opening evening classes in chemistry for them. On the other hand, its success is vitally bound up in the possession of a few properly trained chemists—men who have devoted three or four years at least of their lives to studying chemistry in properly equipped laboratories. Contrast

these two cases—the most extreme that occur to me. In one industry the right and appropriate sort of technical education is the training of the many by a species of not very advanced instruction, which can be readily carried out in any evening continuation school where a room can be spared for a workshop, and where a teacher can be found who is himself a skilled metal worker, well trained in geometrical drawing. In the other industry, the right and appropriate sort of technical education is the high training of the few in an elaborate course of study, conducted in laboratories expensively equipped and provided with appliances for research, and to which several years are continuously devoted. Either kind of education would fail to meet the needs of the other industry. The man who had spent three years in the continuous study of the higher geometry would find no place in the zinc-working industry, while the chemical factory has no use for the smatterer who has picked up the bare elements of chemistry in evening classes."

With such an illustration before us, it would seem that the first thing to be done before deciding on any scheme of technical education for the improvement of our industries is to ascertain by careful inquiry and the experience of other countries, just what form it should take, and how it may be best applied to our existing conditions.

Leaving out agriculture, for which technical education is provided to some extent, our chief industries are mining and engineering. From the nature of things, these will in time be followed by various other industries which depend largely on these two for their support and existence. How, then, can these two industries be best reached and most benefitted by technical education? What are the needs that are most pressing and apparent in them? They may be placed somewhere between Prof. Thompson's extremes, for they both require highly trained leaders to manage and push them forward, and, in the case of engineering especially, every workman requires to be trained to a greater or less degree. Draughtsmen, pattern-makers, turners,

fitters and machinists, are all required to be highly skilled, and a scheme of technical education for the engineering trades must deal with this aspect of the matter. In mining, the demand seems to be, in addition to that for a few highly trained specialists, for technical education which will help the practical miner to fill the various responsible posts, above and below ground, for which his training in actual mine work, added to this technical instruction, renders him eminently fit.

As you are aware, the movement for the higher training of the future leaders of these industries is in good hands, and seems likely to become a success. It may be well, therefore, to consider the question of providing some means whereby the rank and file may also be given an opportunity of supplementing their practical knowledge by some theoretical and scientific training. That the demand for this sort of training exists can be readily shown by the fact that hundreds of our young men are attempting to obtain it by means of the various correspondence schools whose advertisements are spread broadcast over the land. While not for a moment depreciating the good work that is being done by their means, it seems easily demonstrated that a good system of local schools could do the same infinitely better, and reach a far greater number of pupils.

Competent authorities estimate that the amount of money going out of the country annually for these correspondence courses is sufficient to maintain a most complete system of technical education. It is estimated that no less a sum than $150,000 is annually taken from the city of Montreal alone in this way; and about that sum from the three Maritime Provinces. The demand then for technical education of this sort is so obvious that it is scarcely necessary even to call attention to it. But, as to the best means of meeting this demand, much thought and care will be necessary before a decision can be arrived at. Experiments will have to be made, and, whatever scheme may be adopted, it should be elastic enough to permit of this and its adaptation to particular localities.

In considering the question, it is right and expedient to glean what help we may from the experience of other countries, and it seems almost natural to turn to Germany as the embodiment of all the virtues in this matter. It has become so common a thing to refer to Germany's technical education as the cause of her tremendous advance during the last thirty years that it is often overlooked that many other factors have contributed to her success.

First, it seems to me, is the general sense of discipline inspired by her military and bureaucratic system of government. That counts for a great deal, and renders easy the enforcement of enactments which would be regarded in this country as infringements on the rights of the citizens. For instance, in certain towns in Prussia attendance at continuation schools is compulsory upon all youths engaged in the leading industries. Such a regulation would, I venture to say, be fiercely opposed if attempted here.

The greater industry of her people, the lower standard of living, and the consequently low rate of wages for which her workmen are content to labour; also the lower profits which her capitalists are said to be content with, are other important factors. Some authorities consider it open to serious doubt whether German methods of education would succeed in other European countries, and they may be even less suited to countries so different as ours is. Probably, every country will have to work out its own problems, and varying methods are sure to result. Nova Scotia will prove no exception to this, but at the same time much help can and should be gained from the experience of other countries which have been before us in this matter.

Germany's experience may be of great service to us, for it must not be forgotten that she has by no means limited her technical education to the higher branches, but that every grade of it has been established. Apprentice schools, workmen's schools, schools for training foremen, and so on up the scale

until we reach the highest scientific training given in the world to-day.

In the case of Great Britain, the greatest attention has been paid there to the technical instruction of the masses, and higher technological training has not hitherto received nearly as much attention. The decay of the apprenticeship system, and the subdivision of labour caused by the use of machinery in so many trades in Great Britain, have emphasized the need for some instruction which shall in part make good the loss of the older methods of the training of workmen. One result of the Royal Commission on technical education in the early eighties of the last century, has been the establishment of a vast system of evening classes throughout the land. These classes are open at a nominal cost, in most cases, to apprentices, workmen, foremen and others engaged in the various trades. Systematic courses have been arranged for practically every industry—largely by the leading men of the industries themselves.

Speaking generally, the courses are divided into three stages: First—A course of combined lectures and workshop practice, embracing the more elementary processes of the particular industry. Second—A course of instruction in science as adapted to its particular needs. And third—An advanced course involving a combination of the first and second, and designed for foremen and shopleaders. In some instances, such as the building and engineering trades, it has been found necessary to have a preliminary course in addition. This consists of mensuration, workshop arithmetic, simple geometrical and other drawing, such as to fit the students for the special work of their trade classes. In one of the large arts and crafts schools in London, with which I was connected, it was found desirable to give all the evening students this preliminary course. This, because many of them had, to use a common phrase, "forgotten all they had learned," and also largely from the fact that the general trend of their elementary school studies had not been towards a practical application of knowledge. It seems to me that, gene-

rally speaking, the bulk of our young men realize what an education really means to them only after they have left school, and it is at this moment of this realization that they turn to whatever agencies are available to supply the deficiency so often felt. It is then that an efficient system of evening classes will attract the young man, and he will be thereby induced to spend his leisure in self-improvement for his own and the community's good.

I said earlier, and I think you will agree with me, that the demand for this sort of technical education in Nova Scotia is evident. How, then, can we best meet it, and give every young man engaged in our trades and industries an opportunity of obtaining instruction in the theory and science of his particular occupation?

In my opinion, this may be done in two ways at least: First, by establishing in some of our larger industrial centres some special evening schools. Secondly, by extending and developing our present system of evening work as carried on by the Department of Mines.

For the first way there is not much difficulty in planning and equipping a suitable school with class rooms for lecture work, a drawing office, laboratories simply equipped with physical apparatus illustrating the principles of applied mechanics and chemistry; workshops for wood and metal-working, to illustrate the work of the drawing office, and to give opportunities for students to obtain more knowledge of processes and mechanical principles than their daily work gives them opportunity for.

In neither of these directions need the equipment be very elaborate, however, for it must be remembered that the actual processes of any industry are best learned under its normal conditions in the productive workshop; in fact cannot be properly acquired in any other way. The school at best only can supplement the knowledge gained from actual, every-day experience. Again, the underlying principles of many trades and industries

can be taught with practically the same equipment, and that of the simplest sort.

The great difficulty will be the obtaining of suitable teachers, men able and willing to give the necessary theoretical instruction and thoroughly conversant with the practical needs and difficulties of the actual work. Such men are unfortunately scarce; and if any scheme of evening technical instruction is to be successful, we shall have to rely very largely upon the help and co-operation of the men engaged in leading and responsible positions in the industries involved. Such men are doubly desirable, for they are conversant with the latest methods of actual practice, and, in addition, are bound to command the respect of their pupils—mostly youths and men under them in their daily work and would-be-followers in their footsteps. For drawing office instruction, who is more suitable than the practical draughtsman, acquainted, as he is, with the thousand and one problems of daily occurrence in his work?

I need scarcely elaborate this, for many instances will occur to you where the talents, skill and experience of our leading men would be of inestimable benefit to our young men if placed at their disposal.

There is one thing, however, to be remembered in this. Speaking from experience of some years of this sort of work, I may say that scarcely any form of teaching with which I am acquainted requires more patience, zeal and enthusiasm than this same evening class work. Sometimes the apparent results are very discouraging—pupils expect too much and wish to run before they can walk, or they become careless, and the classes dwindle. But the youths who mean business and do stick to the work and the teacher, are not only a compensation to him, but are sure of a reward for their efforts in some good post for which they may thus qualify themselves.

The many counter attractions in our large centres of population often seriously interfere with the regular attendance of

evening students. Therefore, in any scheme of this work the social side should also be kept in mind, and popular lectures and entertainments arranged for at intervals.

Another drawback arises from the varying attainments of the students presenting themselves. This necessitates a large amount of individual instruction in some cases, if progress is to be at all uniform. However, these are difficulties met with in all teaching, and can be overcome by perseverance and patience on the part of the teacher and taught.

You are, perhaps, wondering what this has to do with your association. It is just this, that many of the great institutions of technology that exist to-day are the outcome of some endeavour to solve the problem of technical education by some association of practical men. One of the great technical schools of Chicago, long known as the Manual Training School, is the outcome of the enterprise and public spirit of a body of business men, the Commercial Club of Chicago. Its influence has been enormous, and it has been widely imitated; it now forms a part of the University of Chicago since founded by Rockefeller's millions.

Among European institutions, many instances can be found where their inception was due to the desire of the manufacturers of a town or city to improve the status of their employees and thereby of their business.

To name only one or two established in this way. The textile school of Crefield, the great centre of the silk and velvet trades of Prussia, is considered one of the finest in the world, and was started by the leading men of those industries there. The great French rival to the Crefield Institution, the school at Roubaix, was also commenced in this way, and many other well known instances can be cited.

Many schools in Europe have been founded by the ancient trade guilds or societies, the medieval prototypes of our modern associations and institutions.

The evening classes to which I have referred as a feature of technical education in England, were carried on for years before the government took the matter up by private bodies, viz., the Society of Arts and the City and Guilds of London Institute.

If a beginning can be made, however small and unpromising it may appear, growth is sure to follow. We have a habit of looking to the government to do so much for us that it is sometimes well to rememember that a private body can often take the initiative much better itself. As far as I am able to learn, there has never been much difficulty in getting governments to help in these matters, if shown a way. I do not think that our government will be different from others in this respect, and I have therefore ventured to present these few points for your consideration. If in some industrial centre or centres in this province a small scheme could be set going, the ways and means would, I am sure, follow in due course.

The other method I suggested, was to develop our present system of evening class work. I think this could be done at first in connection with such a school as I have suggested. The staff of the school could be utilized as peripatetic lecturers and instructors, visiting a district say once a week, giving instruction and setting work to be done in the interior between the visits. Arrangements could be made whereby promising or earnest students could be sent to the central school, or even to some higher institution for short periods of a week or so, for work in which special teaching appliances are necessary. In England, the coal-mining industry has benefited greatly by the system of employing travelling instructors to visit the districts of a coal field. At first, the aid of managers and others had to be enlisted, but as the work grew it became possible to employ men wholly for such work. The local technical education authority usually manages the classes under these schemes. The leading industries of a district are always represented upon

the managing bodies, prominent men of the industries being appointed because of their acquaintance with the needs of the locality, and of their special manufacturers or trades.

Here in Nova Scotia the travelling instructor scheme would be the best way of reaching the young men in many districts, and I believe it could be worked very effectively. We have seen what can be done in this way by our department of agriculture. In other countries excellent work has also been done in this manner in many other lines of industry.

The aspects of technical education to which I have ventured to call your attention are not the highest, but I submit that they are at least as necessary as the higher schemes are. The more intelligent and better trained that the rank and file are, so much the better for the future leaders of our industries. We need all forms of technical education, and from all of them good must result. Some may be more necessary than others, but I submit that the benefit which would follow from that form of technical education which, deals with what we may term the lower aspects of the question, would well repay the time, trouble and money which may be bestowed upon it.

DISCUSSION.

DR. A. H. MACKAY.—We have a general system of manual training in woodwork introduced into many of the schools now and the natural sequel is the extension of the work in the largest centres by having some metal work in several sub-branches, giving some training in the elements of work of the kind generally needed in the province. We could also in certain industrial centres, I can conceive, very easily expand the the mining schools. We might begin by giving special instruction in that which is felt to be most necessary, and if success is obtained in that, then the next most important subject could be added. I think the better plan would be to feel our way out a little at a time, and when we find we are successful in this, add the next important department. It is hard

to launch a project perfect in the first trial, there are so many things to be taken into consideration. I think our manual training work should be extended, and practical instruction, as in the case of our mining schools, developed in the industrial centres of the province.

A. McNeil.—This is the first time we have had with us the supervisor of the manual training schools of the province, and it is a great pleasure to have him present. When we first took up the subject of technical education in this society, the manual training school at Truro had just been started, and we thought it would greatly tend toward preparing a basis for higher technical training. It is through Mr. Kidner's influence and ability that great impetus has been given to manual training instruction. I am informed there are nineteen manual training schools in operation in this province. That is a great work.

Observations on Gold Milling.

By J. G. McNULTY.

(Read 19th February, 1903.)

Beginning with the self-feeders back of the mortars, it is a good plan to have the adjusting parts to come on the left hand side, or opposite the belt side. This permits the mill-man to work with far more freedom.

A plate-iron lining is of benefit in the throat of the mortar; for, besides protecting the throat from wear, it serves as an apron to catch any ore dropping from the feeders. The iron plate rests on the throat of the mortar, comes up over the back part, and is turned over and out some five or six inches.

As it is frequently necessary to open and close the battery feed-water supply, and several minutes are wasted in again securing the proper working flow, it will be found convenient to have a globe valve on the pipe leading from the main water supply pipe, to the feed water pipe with two or more "bibs" at the top of the mortar. The globe valve is always set right for the amount of water required. In hanging up the stamps the two "bibs" can be quickly shut off, and when opened again the flow of water is of desired volumn.

I have made extended tests with the front water feed versus the top water feed, and have found the former a decided advantage, especially with ores carrying a considerable per cent. of sulphurets or clayey gangues. The crushing capacity is considerably increased, less slimes produced, and the sulphurets in better condition for concentration.

The water supply for the various purposes about a large mill, should, in so far as is consistant with the conditions, be independent, and the supply drawn from head boxes, giving a uniform pressure. In case wood be used for fuel, it is a good

idea to construct a large wooden hopper with a filter bottom, near to the boiler room, as a receptacle for the ashes. The "leach" from the ashes, fed to mortars by drip cocks, will be found beneficial in keeping the mercury active; especially in the presence of considerable sulphurets.

Various methods are to be found in our mills for attaching the screen to its frame. The following will be found efficient and convenient:—The screen frame is made of 2 in. seasoned hard wood, framed, and provided with ten ¼ inch stud bolts, four along the upper and four along the lower sides of the opening, with one on either end. The screen is punched from a template to fit over these studs, and is held in place by an iron frame made of 3/16 inch thick flat iron, one inch wide, bored to fit over the studs. The screen frame opening is 5 inches by 50 inches. With a suitable socket wrench the stud bolt taps are readily removed, and the screen taken out. One side of the screen frame is made wider than the other, so that by reversing, the depth of discharge may in a measure be compensated for. Intermediate posts are eliminated, thus admitting an uninterrupted flow of pulp along the entire length of the screen.

A convenient method for handling a roll of screen, is to place it on a spool or reel, unroll the length desired on to a table which has a slot running through the center its entire length, then with a stout knife, guided by the slot, the amalgamator readily cuts off the size desired. Low sides hold the screen fair on the table. This simple device keeps the roll of screen intact, and will be found quite a saving of time, especially in large mills.

There is a growing tendency in milling to utilize the stamp mill more as a pulverizer, and depend less upon the mortar as a means of saving gold; that is, endeavoring to make a combination machine of the battery. The idea, I am aware, is quite at variance with the general mill practice of the province. Some months ago I made a series of special test runs, in a large mill then under my management, and the

results convinced me that there was no practical gain in maintaining lip plates, chuck-block plates, and the various other forms of plates, interposed between the discharge and the apron plates; unless it might be that they offer a slight gain in plate area, but additional trouble in cleaning up. There is very little danger in having too much apron plate area. The coarse gold that may be present in a given ore will naturally find its way down between the dies, if conditions be favorable, while the apron plates will take care of the finer gold passing the screen as amalgam.

To maintain the plates up to a high standard of efficiency, they require constant care and attention on the part of the amalgamator. The promiscuous use of chemicals, particulariy potassium cyanide, as a means of attaining this end, should be condemned. Hard persistent rubbing is by far the most efficient, and indeed the only method of keeping the plates in the condition they should be to do effective work. Rather than use cloths in dressing and working up the plates, a stout piece of rubber $\frac{3}{4}$ inches thick, cut to a desirable size, say 6 x 3 inches, will be found far more effective.

By having the apron plates in sections of say $3\frac{1}{2}$ feet in length, they admit of rotation, or having their relative positions changed in the series, ultimately giving a plate equally sensitive and uniform throughout its entire length. The plates are arranged so that succeeding plates average $\frac{3}{4}$ inch, with about the same drop between plates. In construction, the plate taken should be substantial, readily adjusted, preferably by slot wedges at the lower end, and rest on supports independent of the batting or mill floor system, so as to reduce the vibration to a minimum. It is advisabe to pass the discharge from aprons over a cross screen, which is nailed to a light frame and set into the launder at the foot of the table, before it enters the trap or passes to the concentrator, as coarse grains of pulp are apt to find their way on to the plates in changing screens, etc., and become a source of annoyance on the concentrator.

In order that the amalgamator may have the screens in full view at all times, special curtains in front of the screens should be discarded when possible.

In setting up concentrators with a view of securing the greatest efficiency, one can not observe too much care in providing a substantial foundation. A common method is to set the carrying frame for the concentrators on the mill floor and depend upon a few nails to hold it in position. In setting up tables of the Wilfley type, I have found it good practice to construct two rough walls of masonry, with anchor bolts to hold down a 6 x 8 inch frame, on to which the carrying frame of the concentrator is substantially bolted. This arrangement adds very little to the cost of installation, insures the possibility of getting the best duty out of the machine, and materially reduces the cost for duplicate parts.

It has occurred to me that even though the amount of sulphurets in a given ore be not sufficient to justify concentration, it might be advisable to convey the pulp after amalgamation over a concentrator, having previously passed it through a "reduction" box, a large Spitzkasten, in order to sufficiently reduce the volume of the pulp coming from the mill. The arrangement would certainly make a very efficient trap, producing a product which might be treated from time to time in a clean-up barrel.

In cleaning up I use a clean-up barrel of the Truro foundry type, and find it very convenient for many other purposes than the actual clean-up, in the way of working over the sweepings and workings of the mill floor, iron removed in cleaning amalgam, trash collected from behind the battery screens, etc.

The barrel is placed so as to admit of easy changing from the plate floor, with ample fall below for the installation of a sluice and head box to receive the discharge from the barrel. In discharging the barrel, the pulp passes over a small grizzly or coarse screen, within the head box, so as to separate any large pieces of material that may be present, to be afterwards

hand-sorted. The material passing the grizzly goes direct to the sluice, which is approximately 12 feet in length by 18 inches in width. The bottom of the sluice is laid with ordinary rubber door mats, butting ends, and held in place by cleats. This arrangement is simple and effective for collecting the mercury and amalgam. The mats are readily removed with their charge to the clean-up room. As a precautionary measure, the pulp from the sluice is run over a three-tray rocker.

The mill flooring should be double and with sufficient slope to carry all washings into a launder extending along the entire length of the mill and discharging into a sump.

The provision for ample room and light are too often neglected in the average mill structure. Both are important factors in expediting the routine work and repairs.

In submitting these brief observations, I feel that while nothing verging on the original has been advanced, they may, in a measure, refresh ideas in connection with the subject.

The Modern Method of Coal-Washing.

By C. A. MEISSNER, Sydney, C. B.

(Read 19th February, 1903.)

I herewith present to you a few notes on the Campbell Coal-Washing Table that may prove of interest, especially in so far as this table can be made available as a washer for ores as well as coal; in fact for any material to be washed where the valuable matter and the refuse are of distinctly different specific gravity.

In dealing with coal we have the following differences of specific gravity to consider. That of pure coal is from 1 p. c. to 1.3 p. c., while slate has a specific gravity of from 2 p. c. to 2.7 p. c., and pyrites, or sulphide of iron, from 3.1 p. c. to 5.1 p. c.

The whole value of a washing machine lies in its ability to eliminate the sulphur and ash as largely as possible, particularly the sulphur. The ash is largely formed from slate. The sulphur occurs in the shape of solid pyrites, and also more or less as organic sulphur, which in our coals amounts to the definite amount of 1 p. c. The latter cannot be eliminated by washing and whatever amount of this there is in the coal will have to remain.

The great difficulty has been, heretofore, to eliminate the very light flaky particles of sulphur, which in many coals fill all the cracks with a film of yellow pyrites, and are also so thin and light that they have a tendency to float off with the coal. The solid pyrites, occurring in little crystals or aggregates of crystals, is the easiest to wash out. When, therefore, the coal contains this form of pyrites, the thorough washing becomes all the more difficult.

There is usually very little trouble in washing out the slate, though even here in some styles of washers there is always

danger of the fine particles of slate being washed off with the coarser particles of coal, unless very great care is exercised in sizing, or rather, in crushing all coal to less than one-quarter inch in size.

The greatest difficulty experienced heretofore in many coal-washing plants has been the lack of recognition by many of their managers that their successful action is dependent entirely on uniformity of size, for it stands to reason that a piece of coal one-half an inch large requires as much pressure or current of water to carry it away, as would carry away a piece of slate one-third its size, or a piece of pyrites one-fifth its size. This fact, therefore, has always made it necessary with most other washers to grade the coal into its different sizes in order to attain the most satisfactory results.

In this machine the fine powdery coal, while of the same consistency as slate and pyrites, is given a chance to assert its lighter specific gravity and to float away with the current of water mixed with coal, and thus be saved in a form that makes it directly available.

If this table were to be applied to ore and rock, the conditions would be, in most cases, very similar, excepting that they would require a much stronger current of water, as the specific gravity of the ore and rock both being greater than that of the coal and slate—the ore representing in that case the pyrites and slate, and the rock representing the coal—it would naturally require a heavier current to carry away the specific heavier rock than the specific lighter coal, which it would represent, whereas the finer ore would act like fine pyrites and slate and pass through the riffles into the bottom built underneath. With this machine, therefore, it is not necessary to size the coal as closely as is the case for the successful operation of most other washers.

In giving you a description of the plant, I would like to say that I am indebted to my friend, Mr. O. F. Griem, superintendant of the Dominion Iron and Steel Company's coke ovens, for the data and details relating to same.

The raw coal from the mines is received in the form of slack, varying in size from zero to one inch. This slack is dumped into a pit under the coal track and elevated to overhead bins, known as the raw coal bins, and from these the raw coal is drawn and passed over a grizzly, which removes all coal from one-quarter inch to zero, the balance going to the rolls. The rolls are of the corrugated type and are four in number, arranged in a single row, end to end, in pairs of two, and these reduce the coal to the same size that passes through the grizzly, namely, not larger than one-quarter inch.

Each pair of rolls is provided with a hopper beneath, into which all the coal that passes through the grizzly is discharged. These hoppers form the "boots" of the elevators, elevating the coal to the long bin above the washers. The washers are suspended from this bin by swinging suspension rods, and each washer or "bed" as it is called, is provided with an adjustable chute, having a one-inch water pipe arranged at the point of junction of the chute to the bin. The object of this water junction is to stir up and sluice the coal down to the beds in uniform quantity, and at this point of entrance of the water a small slide-valve is inserted, by means of which larger or smaller quantities of coal can be let down over the chute into the bed.

The beds are nine feet long and thirty inches wide, being suspended at their four corners on rods, so that they are free to move backwards and forwards in a lateral direction. This head, or bumping end, is connected with a rod to a loosely hung rocker arm, the free end of which engages a peculiarly designed cam, which is mounted upon a shaft driven by motor or engine. This rocker arm is adjustable, so that one can give a longer or shorter swing to the bed.

The bed proper consists of a central timber or "keel" as it is called, upon which are fastened crosswise, in the manner of a fish bone, five or six strips, eight inches wide and thirty inches long. Upon these cross pieces or strips is fastened a sheet of

galvanized iron, which constitutes the bottom of the bed. Upon the top of this sheet iron, three narrow strips are secured, running lengthwise with the bed, one in the centre and one at each end of the cross pieces, and upon these strips in turn are mounted the riffles. These riffles constitute a false bottom and consist of triangular oak strips, and have an over-lapping strip of galvanized sheet iron fastened to them.

The riffles are set one-eighth of an inch apart, and this space is the means of communication with the hollow space between the bottom of the riffle and the sheet iron bottom of the bed. The sides of the beds are six inches high, and the construction of the top side of the keel is such as to give the riffles and the bottom a slight curvature, and the whole resembles a trough with a serrated bottom.

In the operation the cam is rotated and imparts a backward and forward motion to the bed, through the rocker arm and reach rod connecting them.

The coal being sluiced to the bed with water, the bed soon fills, and the cam motion is such that the bed is brought at regular intervals of time, about sixty strokes per minute, against a block or bumping-post of heavy timber. This serves to agitate the mass upon the table, allowing the heavier impurities in the coal to settle upon the riffles. At each successive blow the slate and pyrites are caused to move up towards the bumping end, the riffles all being set in that direction, until they are finally discharged over the end of the bed into the refuse sluice, while the lighter coal flows with water to the lower end of the bed in the form of a fan-shaped sheet, covering the whole width of the bed. This serves to wash back any larger pieces of coal which have a tendency to move up with the slate.

The fine pyritic flakes and other pulverized heavy impurities pass down between the riffle spaces to the sheet iron bottom, from whence this material is discharged.

The beds have a capacity each of five tons of washed coal per hour, making each bed's work in ten hours equivalent to fifty tons.

The amount of refuse, including what coal is carried with it, is about forty-five per cent., so that each table washes about fifty-two tons of coal per day.

The raw coal, as it originally enters the tables, contains about 6.50 p. c. of ash and 2 p. c. of sulphur. As it leaves the table it contains about 3 p. c. to 4 p. c. of ash, and 1.2 p. c. to 1.4 p. c. of sulphur.

The refuse contains about 40 p. c. to 45 p. c. of sulphur, the balance of about 35 p. c. to 40 p. c. being coal. This, on about 4 p. c. of loss, means a total loss of about seven to eight tenths of a ton of coal to each washing-table per day.

In order to be able to utilize the lost coal in the refuse, the amount of this can be raised in the washing so as to increase the loss to say 6 per cent., which will give a purer coal, but leaving more coal in the refuse. This refuse can then be rewashed roughly on the rewashing beds, so as to get the refuse practically free from coal, and a coal containing anywhere from 3 per cent. to 4 per cent. of sulphur and a proportionate per centage of slate, or with say 60 per cent. to 70 per cent. of coal, which latter can then be used as fuel under the boilers, where this additional percentage of impurities does no material harm, in view of the saving of fuel thus effected.

The construction of these beds is very simple, and the average cost of a bed is estimated at fifty dollars.

The beds are called Campbell Washers, and are controlled and patented by Hyle and Patterson, of Pittsburg.

Notes on the History of Manganese Mining in part of Nova Scotia, and on some of the Geological Conditions of the Manganese Belt running through Hants County.

By W. F. JENNISON.

(Read 19th February, 1903.)

The existence of manganese ores in Hants county, N. S., has long been known. In fact, it is hard to ascertain at just what date the ores were first worked. Legend says that Hants county has the honor of being the first producer of manganese in America. The story goes that the French used *savon de verriers*, their fanciful name for pyrolusite, in making glass and pottery at Piziquid, now Falmouth, Hants county, before the expulsion of the Acadians in 1755.

It is evident from history that the French used manganese in this country, but for what particular purpose and at what date, we have no reliable authority, and know but little of its discovery or history in Nova Scotia until 1861, when it was found at Tennycape.

Dr. Henry How, in his "Mineralogy of Nova Scotia," (page 111,) tells us that in 1861 Mr. Nicholas Mosher, jr., of Avondale, brought him some samples from Tennycape, which Dr. How told him were good manganese ore. On diligent search he found the ore to occur in nodules, from the size of a bean to that of twenty-four pounds, a sample of which was sent to the exhibition in London the following year. The first shipment of about eight tons was sent to Windsor to be transhipped to England in 1863. An average analysis of this ore gave 91 per cent. oxide, and sold in England for £8 10s., and £9 per ton. Messrs. Tennant, of Glasgow, are reported to have said they had never seen ore so fine.

Since that time, Tennycape has been worked intermittingly and has been the best producer in Nova Scotia.

Tennycape is situated about thirty-three miles from Windsor, on the south side of Minas Basin. The manganese here occurs in the lower carboniferous belt beginning on the west side of the Avon River and running eastwardly in a tortuous course to the Shubenacadie River, having a length of forty-five or fifty miles.

The principal deposits on this belt, mentioned in order of their importance, are the Tennycape and the Pembroke, both of these owned, controlled and worked by the Tennycape Manganese Mining Company, Limited; the Churchill and Wm. Stephen mine at Walton; the Parker mine at Tennycape; the Cheverie mine at Cheverie; and the Scott property at Minasville.

The outcrops of this belt are numerous and can be easily traced; but the deposits of manganese have their particular zones, and are not disseminated throughout the whole belt, as miles of the limestone may be found not carrying any appreciable amount of manganese.

As regards the occurrence of manganese in this belt, I must differ from the general opinion of many eminent authorities that manganese is always found in pockets. In this particular I will confine my remarks to Tennycape and Pembroke, which I had a special opportunity to study. The limestone belt here, which varies in thickness from 150 to 300 feet, may be divided into three distinct sub-divisions, and in each sub-division the mode of occurrence of the manganese is quite different from that of the others. Immediately overlying this belt are masses of gypsum, and what is known as the foot-wall is Devonian quartzite.

Beginning at the top, the first sub-division is a brecciated limestone about sixty feet thick. This is known to the miners as the "soft ground." In this the manganese occurs in round masses or pockets, from the smallest to the largest size. The famous Dykeman pocket, about one thousand tons, was taken from the grounds at Tennycape. When the pockets are taken

out not a perceptible trace of manganese can be seen, and nothing to lead one to discover another deposit.

Under this is a massive limestone, which the miners term "white rock." At Tennycape this is about seventy-five feet thick, color light grey, and its solidity is such that in drifting or sinking in it, very little, if any, timber is required. In this the ore occurs in lenticular veins, having a regular dip and strike, varying in thickness, sometimes pinching out to almost nothing, but always leaving a "leader" to follow.

Although the rock here dips south at an angle of from 45 to 60 degrees, yet the ore veins dip north, generally at high angles, at the same time having deepening inclination westward. Within a distance of two hundred and fifty feet, I have followed the inclination of one of these veins from the surface to a perpendicular depth of one hundred and sixty feet—the deepest workings at Tennycape at that time.

Under this, and separated from the Devonian quartzite by a few inches of clay, is a laminated limestone, known to the miners as the "slate belt," having an average thickness of fifteen feet, carrying numerous regular veins of very high-grade ore from the smallest size up to five or six inches, running in all directions. This, possibly, is the most valuable of the three. It has been estimated that if the entire belt were taken out and concentrated, it would yield from 15 to 20 per cent. ore, yet it has never been worked to any extent.

Admitting that the conditions here are very different from those of many other deposits in both Canada and the United States, yet knowing and closely watching these conditions, modifies very much the old opinion that manganese mining is most uncertain and that we never know what should be done next when mining this mineral.

The workings of Tennycape consist of one main shaft, one hundred sixty feet deep, with levels running east eighty feet and west about one hundred and ten feet. This ground has been

fairly worked out to the surface, except what is known as the "slate belt."

One hundred and twenty-five feet east of the main shaft is another ninety feet deep. From it the levels run west to connect with the workings of the main shaft, and east about one hundred and twenty-five feet.

As to the plant, one would judge from the appearance of it, that the Egyptians were not only the first discoverers of manganese, but that they had first mined the mineral at Tennycape, and that no improvement had been made in the plant since that time. No modern concentrating plant has ever been installed, and what has not been saved at the cobbing table has practically gone into the waste dump. These dumps have been estimated to contain fifty thousand tons of material, which will yield 10 per cent. ore. Why a modern concencrating plant has not been installed in a mine with the possibilities of this one, is hard to explain, for it is a mine which has been known to the world for over forty years, and whose ores have sold in the United States as high as $140 per ton, and never less than $40 per ton, and which can be treated with at least some degree of certainty of workable profit.

Stamp Milling Practice in Nova Scotia, and the Advantage of Introducing Water under Pressure below the Crushing Surfaces in the Gold Stamp Mill.

By M. R. O'Shaughnessy.

(Read 19th February, 1903.)

At the request of a number of our successful Nova Scotian gold miners and leading members of the Mining Society, I submit for their consideration the following notes on Nova Scotian practice in wet-crushing stamp mills:—

These notes may prove useful and instructive to possible investors and mining men who have no practical knowledge of stamp milling Nova Scotian ores. I use the term "ores" as applying to all material removed by mining operations that eventually passes through the mill. The extraction and recovery of values in gold from our ores by stamps, does not always get the serious consideration that it justly deserves.

It is not my intention to impose on the time of the society, but, that my notes may appear clear and be readily understood by the men now before the stamps in our scattered mining camps, it will be necessary to call attention to the two different types of mills now in use, namely, the light mill, equipped with 650 lbs. to 700 lbs. stamps and capable of pulverizing one and a half tons per stamp in twenty-four hours, and the modern heavy high-speed mill, equipped with stamps ranging in weight from 850 lbs. to 1100 lbs., capable of pulverizing from two to four tons per stamp in twenty-four hours.

But the question may be asked, How does the heavy mill differ from the light mill in the pulverization of ores and collection of values in gold? A brief description of the practical working of the two mills will be necessary at this stage to demonstrate the relation one mill bears to another.

I will first take up the practical working of the *light mill*, and endeavor to point out that this mill in general use previous to the introduction of the modern heavy mill, was not, and is not to-day, when intelligently operated, the "old trap" that a great many miners believe it to be. As you are well aware the extraction of gold from our ores depends, with a few exceptions, on the one machine, namely, the stamp mortar with plates, and in all cases where the mill is in an isolated district, the one that appears best adapted to the extraction of gold is the light stamp and roomy mortar with a capacity of about one and-a-half tons per stamp in twenty-four hours, hand-fed preferably to automatic, unless a first-class automatic-feeder is installed.

Let us assume that the light hand-fed mill is ready for commission, and the writer is in charge preparing for a run. After determining that the thrust of stamps is directly on the dies, the fronts are placed in position, the base of mortar, including dies, is covered thoroughly with sand or pulp recovered from the mortar in a former clean-up, screens are examined, placed in position, and made secure.

One of the most important points in practical stamp-milling, is the protection of the gold after it has been liberated from the gangue by the action of the stamp. Such being the case, it will be apparent that in order to mill successfully, certain rules and regulations will have to be followed in the method of operating in order to secure the desired protection of the gold from the wearing action of the stamps and pulp in the mortar. One of the best methods to obtain this result is to take advantage of the law of gravitation. Nature having been generous to gold, has endowed it with extraordinary gravity, hence, all that is necessary to readily take advantage in the light mill of the laws of gravitation, and protect the gold after it is liberated from the ore, is to give strict attention in feeding ore and water during the first few hours' run of the mortar. By close or thin feeding for the first few hours, a stationary base is formed in

the mortar. This base is the surface of the solidly packed sand that forms in all the mortars not otherwise fitted with appliances for preventing the stemming and packing of sands around the dies. By careful attention to feeding ore and water, it is possible to establish this base from one to two inches below the crushing surface of the dies, and, if care is exercised throughout the run in feeding ore, supplying sufficient water at all times to meet the requirements of the pulverized material, the material within the mortar will be displaced and washed by the action of the stamps to a depth of two inches below the crushing surfaces of the dies. One of the apparent advantages of the light mill is due to the easy pulsating motion given the pulp when properly supplied with water and ore. The liquid condition of the pulp allows the different atoms of the ore to find their relative position by gravity, hence the material having the least weight escapes from the mortar first and all particles of greater gravity are retained in the mortar the longest period of time and are reduced to the greatest degree of fineness. In nearly all our Nova Scotian ores, gold is closely associated with the sulphides of iron or other minerals which are retained longest in the mortar until almost reduced to slimes, thus liberating a large percentage of gold that owing to prolonged abrasion readily amalgamates. Its weight will readily find it a resting place on the base line of mortar, the crowns of the dies acting as riffles to arrest the particles, whether pure amalgam or sulphurets carrying a percentage of gold.

Any person familiar with the panning motion of the moving pulp in the mortar under displacement by the stamps in the light mill, can readily comprehend the advantage of an abundance of water on the crushing surface of the dies. It materially increases the efficiency of the mill as a pulverizer, by washing out the disintegrated parts of the ore on the surface of the dies when the stamps are not resting thereon. It readily adjusts the pulp uniformly under each stamp, and it is at this stage of

the crushing that the mill-man should see that the base of the mortar is formed at least one and one-half inches below the crushing surface of the dies, and know that at all times sufficient water is being supplied to thoroughly wash the dies after each thrust of the stamps, as the displacing force of the descending stamps is the agency whereby the sand is mechanically displaced alternately from one die to another. It is only necessary to supply sufficient water and feed low or thin, to successfully displace the pulverized material after each thrust of the stamp. Such being the case, the liquid condition of the partially pulverized ore resting on the surface of the dies enables the broken or separated atoms of ore to take advantage of gravitation; and regardless of the agency of mercury, coarse and heavy gold readily falls a prey to the pockets created between the dies for the purpose of its protection after it has been liberated from the ore.

A large percentage of what is termed float-gold that escapes from the mill in the water, is created by the action of the stamps reducing the gold to minute particles before the active and expelling force of the stamps is enabled to discharge or lodge them in a place of safety on inside plates. Knowing, as we do, the soft malleable nature of gold, it is apparent that a large percentage of values escapes from poorly managed mills in the form of worn gold created by continuous exposure to the action of stamps and sands.

It will be apparent to any thoroughly practical, observant mill-man, that a great many of the difficulties surrounding the extraction and collection of gold in Nova Scotia is created by the very methods applied for the recovery of the values. As a rule, our gold-bearing ores may be considered practically free-milling, and a large percentage is coarse and granular gold, which, if protected from wear and tear, is easily recovered by the stamp mill wet crusher. If proper methods for the protection and collection by gravitation in the mortar of the coarse

gold so commonly found in our ores, is put in practice, amalgation is only necessary for the finer and smaller atoms whose gravity is overcome by the action of stamps and which are expelled from the mortar through the screens. The conditions for early amalgamation are clear liquid and sharp pulp, so apparent in mortars supplied with low or thin feed, and an abundance of water to carry off the ever recurring slimes. In the majority of our mills the supply of water to the mortar is governed by the flow passing over the stationary plates that were probably placed in position during the construction of the mill in accordance with the practice of an altogether different district. The plates can only be used as an indicator of the proper supply of water required by the mortar, after a series of experiments have been made to determine the required volume, and in all cases it will require adjusting to suit different qualities of ore.

Another favourable feature in connection with the condition of the mortar as above described, is in regard to the quicksilver, the principal agent in the recovery of the finer particles of gold. There is no danger of creating losses through an over-abundant use of mercury when the mill is running under thin feed and the pulp is being displaced and washed two inches below the surface of the dies.

The moving pulp will suspend, or keep suspended, for a limited period of time the mercury so supplied, whether in small or large quantities, and whatever particles of gold mingled with the pulp are in like manner under suspension, will have an opportunity to become amalgamated with the mercury, if previous to the association the specific gravity of the particles of gold was sufficient for it to take a suspended position against the mechanical displacing or discharging wash of the mortar. Such particles of amalgam once settling or sinking below the crushing surface of the dies will be retained on the base of the mortar by the affinity of other larger or smaller deposits of amalgam or mercury, as the case may be, and by the specific

gravity that has already been the chief factor in arresting the gold from being discharged after liberation from the ore. But too often, through carelessness or ignorance of the mill-man, the period of crushing is prolonged without a clean-up until the crushing surfaces of the dies have worn down to the deposits of amalgam and mercury collected between the dies and the values are churned out as the run is continued. By the method here described, the mill-man will recover probably seventy per cent. of the deposits and find the same adhering to coreholes and rough surfaces in stamps, shoes and dies, screen frames, and any rough surface that the pulverized amalgam may come in contact with inside the mortar; and lastly a large percentage adhering to plates outside the mortar. A portion of the loss may be recovered on concentrators at the tail of the mill.

Another common method of increasing the wear and tear of gold and the losses, is to start with the mortar running in a choked condition, either from too high fronts, insufficient water supply, or by supplying ore to the mortar in quantities and at periods that do not allow the water to reach the crushing surface of the dies. Under this method of milling or starting a mill run, it takes but a few hours to stem or thoroughly pack the mortar to the surface of the dies with the pulverized material in such a manner that nothing will remove it but bar and pick on clean-up day. In this condition of the mortar, what is the result when coarse granular gold is liberated from the ore? The activity or the discharging force of the mortar is not capable of removing it immediately out of harm's way; and if it were, the screens would not allow the gold to escape in its granular or coarser form. If inside plates are used, it has to become amalgamated before it will adhere to them, and if bulky and having sharp angles the wash of the mortar will not allow it to remain on the plates until some of its sharp corners become worn off. If mercury is supplied in larger quantity than the gold being liberated will take

up, it will settle to the base (in this case the crushing surface of the dies); and if the quantity of mercury supplied happens to be much in excess of amount required, its presence on the surface of the dies forms slush amalgam. This slush amalgam resting on the crushing surface of the dies holds with a subtle grip small and coarse gold alike, to be thoroughly pulverized before being discharged or lodged on the inside plates. If, on the other hand, we do supply sufficient mercury to a mortar running under conditions to meet the requirements of the gold being liberated, we run the risk of the gold being pulverized or beaten into minute, thin sheets that will not combine with the mercury, and that will eventually escape unamalmagated.

In my opinion, the mill-man that can judge the happy-medium in supplying mercury to the mortar run in conditions as above described, is not very much in evidence in our mining camps. In my practice I have found the light mill give best satisfaction by operating with medium fronts, fine screens, and abundance of water, thin feed, frequent beating-out of the mortar, and by avoiding too prolonged a run without a partial clean-up. In all cases I speed the mill to its limit with a reasonable drop of stamp, and depend on gravitation for the protection of the values when liberated from the ore. Twelve years of my twenty years' milling practice were spent before the light stamps, milling ores ranging from $1.00 to $2,000.00 per ton, and when the mill was operating continuously, one shift under my personal supervision, I never entertained any apprehension as to the result on clean-up days. In my practice I have always found the light mill give splendid results as a gold-saver and collector, when operated by methods that I have described in part as above.

Having devoted a good deal of space describing the working of the light mill, I will now briefly as possible describe the practical working of the *heavy high-speed mills* on Nova Scotia ores.

I may be asked, Why cling to the light mill in the treatment of our ores when our leading mining men have introduced the modern mill? I must admit that the modern mill is undoubtedly an improvement on the light mill when considered as a pulverizer of ore, and had our mining men confined the mill to the pulverization of the ore by a system of rapid, coarse crushing, and depended on secondary treatment for the recovery of the values in gold, a system or method of milling could be put in practice whereby the milling capacity of our mills could be almost doubled, and conditions under which losses may now occur avoided.

At the time of the introduction of the modern mill into our mining camps, men and owners made a general movement to retard the crushing capacity of the mill, practically defeating the very end they were seeking. In the first place they got the idea that the rapid high-speed of the mill brought about the expulsion of the gold before mortar amalgamation had taken place; thus they jeopardized the chances of recovering values on the outside plates. To remedy this trouble, coupled with a great many more imaginary difficulties, they reduced the speed of the mill, in some cases from twenty to thirty per cent., never thinking for a moment that in so doing they were practically checking the displacement of the pulp from one die to another and choking the mortar unless the greatest precaution was exercised in feeding the ore. The reason for this condition of the mortar in the modern mill when speed is reduced, is the difference of design in the cam of the improved mill compared with the cam of the old type of mill. For example, the period of rest of stamp on the dies in the old mill, dropping eight inches and making 60 drops per minute, is about equal to the modern mill dropping six inches and making 110 drops per minute. It will be apparent, that in order to ensure satisfactory displacement of material under the stamps and to enable sufficient water to reach the crushing surface of the dies, especially in mills not

equipped with improved methods of supplying water to the mortar, the stamp should be lifted the moment the descending stamp has been retarded by the material on the dies, and the slowing down of the improved mill is a serious mistake. It not only deadens the activity of the pulp in the mortar and retards the crushing capacity of the mill, but where slate is present throughout the ore it also brings about a pasty, mucky condition of pulp on the surface of the dies, due in a great measure to an insufficient supply of water to wash out the disintegrated material after each thrust of the stamp.

Mortars running under such conditions practically stem or pack solidly all recesses between the dies, and the crushing surface of the dies forms the interior base of the mortars. In such cases where a sufficient quantity of water fails to reach the crushing surface of the dies it matters little what the interior form of the mortar is, for the pulp itself will build up a design of solidly packed sand, converting the interior design above the surface of the dies into what resembles very much a farmer's dug-out pig trough, and in such a trough a good share of our Nova Scotian gold-bearing ores have been pulverized since the introduction of the modern heavy mill.

High fronts and fine screens have been used to prevent the gold escaping from the mortar. High fronts and fine screens are conductive to fine grinding, and no doubt liberate a large percentage of gold that would otherwise escape in low fronts and coarse screens. When, however, you increase the height of your fronts and use closer screens, you also increase the difficulty of having a sufficient supply of water reach the crushing surface of the dies to thoroughly wash out the disintegrated particles of pulp after each thrust of the stamp, and also to keep the base below the crushing surfaces of the dies, so essential to the protection of the coarse particles of gold so common in our ores. The question is before me at all times, Do we, by raising fronts and using finer screens and subjecting all the gold values to the pulverization action of the stamp during the period of

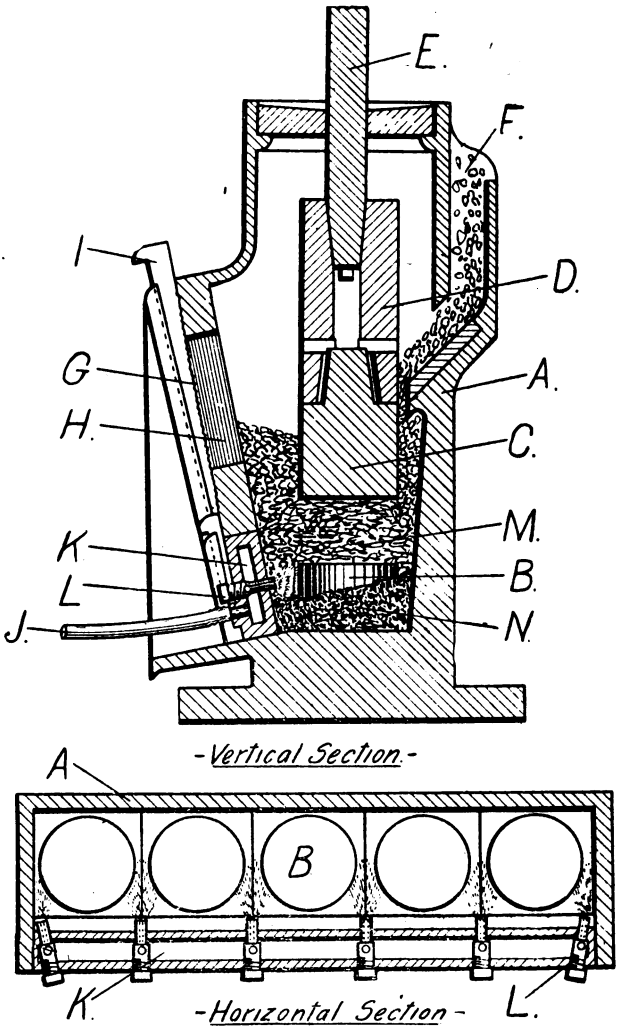
the run before the clean-up is made, lose in float gold (or what I term the wear and tear of gold) an equivalent in values equal to what we liberate by fine grinding ?

The first difficulty that I encountered in the improved mill was the protection of values after being liberated from the ore. This difficulty was chiefly due to stamming and packing of the sands between the dies, which, without constant attention to automatic feeders, I could not avoid.

With this difficulty continuously before me in operating the modern mill of the Tudor Gold Mining Co. at Waverley during the summer of 1895, I conceived the idea of putting in some form of agitator to continuously disturb the sand between the dies in such a manner that any atoms of the ore having extra gravity would readily find a safe place from the action of the stamps and the severe abrasion of sand.

After utilizing what little mechanical inventive genius I possessed, I finally decided that the water usually dropped or directed into the mortar on top of the pulp, if directed into the mortar by means of a series of small jets or nozzles at any desired point below the crushing surface of the dies, would bring about the desired agitating result, supplying a mechanical agency whereby I could be assured that at every stage of the mill-run all coarse particles of gold would be recovered without the agency of mercury, and that a sufficient quantity of clear water was being directed on to the surface of the dies to wash out the disintegrated particles after each thrust of a stamp.

I have also found that under any condition of feed, height of fronts, or fineness of screens, the water directed under pressure, as herein described and shown in the accompanying illustration, will at all times during the run of the mill keep the recess between the dies so freely agitated that battery iron, nails, and gold in small or coarse particles readily become deposited between the dies, and if any reasonable attention is given to the



A Mortar. *B* Die. *C* Shoe. *D* Stamp-head or boss. *E* Stamp rod. *F* Feed opening. *G* Screen. *H* Screen opening. *I* Battery key or key wedge. *J* Water supply pipe. *K* Water chamber. *L* Water jet or nozzle. *M* Ore under action of stamp. *N* Gold and heavier particles of ore lying protected about base of die.

supply of ore to the mortar there will be found little or no difficulty in keeping the wearing surface of the dies and the stamp-shoes perfectly square or level. I maintain that the capacity of the mortar is also increased because of the presence of clear water directed into the pulverized material immediately after the thrust of each stamp. By this system of water supply, the material under the stamp, while being displaced alternately from one die to another, has to pass through or take with it a fountain of clear water. Hence, it should be apparent to every practical man that the heavier ore will readily sink into recesses between and around the dies.

As an example of what can be done in a mortar supplied with water directed under pressure as herein described, the following may be of interest:—During the month of November, 1900, I superintended at Renfrew the Thompson clean-up of 2700 ounces of gold bullion and made a practical test of one battery of five stamps, dropping five inches and making 110 drops per minute, with 6-inch fronts and No. 37-mesh screens. From one run of an hour and twenty minutes on specimens, I received one bar of gold bullion weighing 666 ounces. Of this amount 95 per cent. was recovered below the crushing surfaces of the dies, about 2½ per cent. was attached to the interior of the screens, and the balance of 2½ per cent. was on the outside plates. The run was witnessed by three men besides myself, and I consider the run practically showed the thorough protection coarse grains or even small particles of gold get in a mortar supplied with water directed under pressure below and between the crushing surface of the dies. In the majority of cases where the tailings from mills are not subjected to a secondary treatment to recover values lost by coarse crushing, I contend that by applying the water as herein described, the stamps could be allowed to reduce the ore to a slime, and yet not injure the values in gold; and when clean-up day came, the gold would

(with the exception of a very small percentage which fine grinding had liberated and discharged on the outside plates) be found deposited between the dies in particles still having their sharp angles, and as free from wear as when first liberated from the ore.

Limits of the Workable Coals of the Cumberland Coal Fields in Nova Scotia.*

By HUGH FLETCHER, Geological Survey of Canada.

(Read October 27th, 1903.)

No originality is claimed for the views here presented which have been either clearly stated or hinted at by such competent observers as Sir William E. Logan, Abraham Gesner, John Rutherford, Professor H. Y. Hind, Sir J. W. Dawson, Scott Barlow, Walter McOuat, Dr. R. W. Ells, Dr. H. S. Poole, Dr. E. Gilpin, and others, and are at once suggested by geological maps of the district. As the facts are frequently overlooked or ignored by explorers who still search for coal only near the surface in a region, easily accessible and long explored, in which mines have been worked for many years and no important recent discoveries of coal have been made, I may call your attention, as practical miners and explorers of a province noted for the large production of minerals in proportion to its area and population, to a few points brought out by investigations. These have lately been made to define the structure of the southern rim of the Cumberland coal basin and test the probability of finding along it coal seams that do not come to the surface, but are apparently buried beneath overlying rocks.

The strata of the great section of the Joggins coast, which have an aggregate thickness of about 15,000 feet, may be subdivided as follows in descending order :—

Permian or Upper Carboniferous,
Coal Measures,
Millstone Grit,
Carboniferous Limestone or Lower Carboniferous.

They lie in a basin on the north side of which the coal measures,

* Revised by Mr. Fletcher, February, 1904.

dipping south at an inclination varying from 45 degrees to 16 degrees, extend eastward about twenty miles from the shore at the Joggins mines, while on the eastern or Springhill side they strike southward to within a short distance of the Cobequid Hills and dip westward for the most part at an angle which seldom exceeds 30 degrees.

The main seam of the Joggins mines is overlaid by 4740 feet of sandstones and shales, of which 2473 feet in the lower portion include small seams of coal. The top of these overlying rocks is at Shulie, eight and a half miles distant, and southwestward from that place they follow the shore in nearly horizontal attitude for some miles, then in descending order form a section which seems to repeat the foregoing rocks for a distance of about twenty miles as far as Apple River and Spicer's Cove, giving a thickness of perhaps 3500 feet of uniform colour, composition and texture. At the base 500 feet or more consist of conglomerate, composed of large pebbles and blocks of the Devonian granites and felsites, which immediately south of Spicer's Cove form the western limit of the Cobequid Hills.

The only regular coals southwest of Shulie are found near Spicer's Cove, immediately overlying this conglomerate.

These small and otherwise unimportant coals suggest questions of great practical value. What is their relation to the large seams of the Joggins and Springhill mines? If the latter could be reached by a shaft or boring 4740 deep in the basin at Shulie, can they be cut nearer the surface at Spicer's Cove and elsewhere? Have they thinned out and been replaced by conglomerate in this direction, or have they been cut off by a fault?

A general section from Minudie to Apple River faces page 150 in Dawson's Acadian Geology, which is also applicable to any line from the Cobequid Hills northward to the coal seams between the Joggins and the Styles mines; several broad folds, however, in some places repeating the rocks between the shore and the hills are shown on the Apple River sheet just issued by the department of the Geological Survey (Nos. 100 and 101).

Dawson's section makes most of the rocks southward from Shulie River to Spicer's Cove equivalent to the uppermost rocks from Shulie northward and shows a small coal seam near the bottom, but it does not prolong the Coal Measures beneath them and the text speaks of "conglomerates and other Lower Carboniferous rocks" as forming the southern edge of the trough and resting on these the beds of the coal formation still dipping to the northward. May not the conglomerates, however, be younger, overlapping in places rocks which include workable seams of coal?

To test these strata which are cut across by the Shulie, Hebert and Maccan Rivers, two boreholes were begun in the autumn of 1903. The first at Spicer's Cove, still in comglomerate, is now over 500 feet deep.* Another, twenty-seven miles to the eastward on the west side of River Hebert, one mile** below the outlet of Fullerton Lake, is about 600 feet deep. The latter is about three miles north of the Devonian metamorphic rocks and only twelve miles west of the Springhill coalfield where the uppermost coal seams have also been traced to Rattling Brook and, on Upper Maccan River, to within three miles of the Devonian rocks of the Cobequid Hills.

To the eastward of Springhill the Coal Measures are underlaid by Millstone Grit and Lower Carboniferous rocks on what Professor Hind has defined as an anticlinal dome,† the result of intersecting cross anticlinals. They include the small seams of coal exploited at Polly Brook, Oxford Junction, Big Lake and other points, which overlie a comglomerate at the base of the millstone grit and form the bottom of another basin on the east side of the dome. But none of the large seams re-appear before Thompson Station is reached, where these rocks are apparently overlapped unconformably by Upper Carboniferous red comglomerate, sandstone and shale, in a basin extending thence to the Pictou coal field.

* About 730 feet deep on June 11, 1904.
** About 1725 feet deep on June 11, 1904.
† The Nova Scotian Mining Number, Oct., 1903, page 30.

Here again a problem of great importance is presented. Do seams of coal of workable size exist at an accessible depth in this second basin, east of the Springhill dome, and within which new coal mines may be established?

The chance of reaching, even at a great depth, coals like those of Springhill and Westville, appears to be worth the cost of trial boreholes south of Big Lake and Dewar River. On the other hand, success cannot with certainty be predicted at any point because of irregularity of thickness of the seams, such as is characteristic of both the Pictou and Cumberland coal fields. In tracing the Coal Measures eastward a few miles from the Joggins mines, for example, we find that the seventy coal seams there exposed nearly all disappear, and that a mass of conglomerate, estimated to be 1500 feet thick, replaces the fine, soft strata of the shore. Moreover, in many places Permian rocks rest directly upon others older than the Coal Measures; and it is possible that the latter may occupy only unimportant areas within a workable depth. Yet the money ineffectually spent year after year in shallow borings and diggings by the holders of leased areas would be sufficient with the aid of the government drills, economically operated, or by means of deep holes bored by contract, to prove more than can be done in any other way.

DISCUSSION.

MR. FLETCHER illustrated his remarks by detail maps of the region, the inspection of which led to a strong desire being expressed for their immediate publication.

At the conclusion of the paper a dissussion took place on the work of the Geological Survey in Nova Scotia. (See p. 61).

J. A. JOHNSON.—I move that the thanks of the society be given to Mr. Fletcher for coming here and giving such an interesting address in relation to his work in Cumberland County.

HON. S. H. HOLMES seconded the motion, which passed.

A Trip to West Virginia.

By Henry S. Poole, D. Sc., F. R. S. C.

(Read 27th October, 1903).

A traveller in a country new to him is naturally most interested in the features which are unfamiliar, while such as are similar to those amid his own surroundings are accepted as matters of course. The few remarks I may make are from this point of view, and will be limited to circumstances and practices differing from those in force with us. To the structure of the country is due much of the novelty that is associated with coal mining in West Virginia. Instead of digging down to lower depths and erecting machinery to hoist coal and pump water up to the surface, the miner of that country does all the hoisting that is done in himself, in climbing the hillside to his work; and then he finds appliances for lowering the product of his labor to depths of hundreds or perhaps 1,000 feet.

The structure of the coal field is due to the foldings of the Appelachian mountains, carrying on their western flanks strata of the Carboniferous, which were elevated to a general level of some 3,000 feet above the sea. The mountain folds gave a course to the streams, which now flow in valleys far below their crests, only breaking across the ranges by "gaps" at rare intervals. These streams make their way to the main drainage of the continent, and are joined by tributaries flowing with the gentle dip of the measures to the north-west at right angles to the axes of the folds. Creeks, forks and branches gather the waters of the ancient plane, and from their fountain heads have deeply carved it into V-shaped valleys. The country lies to the south of the region glacier-bearing during the Pleistocene period, and no foreign till cloaks the surface to cover up and

hide the outcropping of the horizontal coal-bearing beds. The absence of erratics and far-carried stones is a noticeable feature to anyone disposed to speculate as to the origin of the boulders that strew the fields of New England and Eastern Canada. The streams that flow on the immediate flanks of the western ranges, having cut through all the strata of the carboniferous, have exposed to view members of the Devonian system, and thus it is that the lowest series of coal seams are only found high up on the eastern hill-tops in isolated patches; but as the inclination of the strata is uniform, some 60 to 80 feet to the mile, it soon brings the lowest of the beds near the bottom of ravines, and then the gentle dip continuing to the northward a few miles further sees them entirely under water. It is of interest to note that the general opinion of the country, shared in by the officers of the geological survey, is that the disappearance of these coal seams below water level of the streams is coincident with their diminution of thickness.

The several groups of coal seams vary in quality with their position in the series. The lowest are very low in volatile matter to be coking coals, and they are also low in ash. They supply the celebrated New River and Pocahontas coke and smokeless coals, of which we hear so much, as shipped at Newport News and Norfolk. A broad strip of barren measures then succeeds them, and this in turn is overlaid by another series of seams, much higher in volatile matter and supplying excellent gas coals.

To find inland markets for the coal of this field, it has to be carried long distances, and even for shipment by vessel the coal has to be conveyed 350 to 450 miles. For this reason preference is given to trucks or cars of large size, of 80,000 and 100,000 lbs. capacity, a train of coal being made up of 20 or 25 of such cars. These cars are in some cases made wholly of steel, and in others the body is of wooden planking on a steel frame. Of the relative merits of the two makes there is a diversity of opinion, the question largely turning not on the durability

of the car, but on the ease with which it can be destroyed in case of wreck and the necessity of getting the single line of railway track quickly clear and reopened for traffic. While the wooden car may be readily cut up or repaired, or burnt to get it quickly out of the way, the steel car is apt to get so twisted in a wreck as to be past repairing, and then is not easily broken up or moved aside in a cutting. To meet such an emergency, by no means unfrequent, wrecking trains are now equipped with pneumatic tools to expedite the work.

The steel cars now made to carry an equal quantity of coke are fitted with four pairs of bottom doors to accommodate the necessarily greater length.

Everyone knows there are snakes in Virginia, where the puff adder still basks on the bankside in the early morning sun, and the black snake rests his length in the shade, indifferent to the passer by on the bridle path; but the rattler has given warning so often to his own death that now he is seldom met with, except in the rocky ravines.

Speaking of paths, recalls to mind the charms of the virgin forest, man's ancestral home, which there has great trees, straight and tall, of poplar and oak, three and four feet in diameter, surrounded by younger members of the family growing up to take the monarch's place in the centuries to come. To find one fallen is rare indeed, unless it bears the mark of man's axe, for the last natural death occurred so long ago as to leave no crumbling trace remaining now. Compare this primeval scene with one of our own woodlands, strewn with windfalls, impenetrable with underbrush, and puncturing the skies with sad rampikes. For the mines of Virginia, pit props and puncheons growing to required sizes as with us, are unknown, but large trees are cut in suitable lengths and split into "bars" with which to do the timbering underground.

The labor problem receives special treatment in parts of Western Virginia, and capital recognizes the importance of dealing with the walking delegate and his disturbing influence. In

some of the valleys the stranger is made quickly to understand the atmosphere is for him unhealthy, unless when asked his business, his answers are frank and satisfactory. The man who posts a notice calling a meeting of miners quickly realizes the order of his going, and the workman who should happen to drop in at any such meeting and air his views, finds his money ready for him and his place occupied next day. There is no hesitation. In one section a strike was started a year ago, and although the strikers were still out and in receipt of relief from the Union, the mines were all at work and the output only dependent on the car supply. There were, however, signs of the strike to the initiated, and they consisted of sentry-like boxes standing by the wayside, in command of the approaches by road and rail. These shelters were occupied by burly armed men to interview the stranger. Then there was one structure more elaborate than the rest, a martello-like tower on stilts, fitted out with search light and gatling gun. Stationed on a high mound, it commanded the entrance to the mine, the village and the approaches, and it was further protected by an insulated wire fence charged with 500 volts from the mine dynamo. Up to the time of my visit, the only casualty was a cow. In the meantime the men on strike drew their rations, and either loafed or farmed.

In my own case, although never before had I been in a position to be mistaken for a walking delegate, I was given a pass to save me from possible annoyance. What that might be I formed some idea from hearing a fellow-traveller in a stage recount his experience, how that he had been accosted on his arrival the preceding day and requested to explain the object of his visit. His explanations seemed to have been accepted until evening shades prevailed, when a further enquiry was made whether his business there was completed. On his replying that it was, and that he proposed spending the night with a relation, his interrogater would not think of it, and he felt constrained to pass outside the assigned limits.

Coke-burning, although not an unfamiliar process, had its exceptional features in the long rows of ovens, occupying the bottom of the narrow valleys, which by night lit up the way that by day had a pall of smoke hang over it more and more dense as one passed westward. The greatest surprise, however, was occasioned on seeing blocks of new ovens going up beyond rows showing no signs of ever having been used. What did this seeming waste of capital mean? It was incurred to base a claim on the transportation company for additional coal-carrying cars, the practice being to allow one car for every five ovens at the mine, whether in use or not.

DISCUSSION.

A. DICK.—The ease of mining coal in Virginia and its consequent economy, is somewhat neutralized as compared with Cape Breton by the distance of the Virginia mines from tide water, so that Nova Scotia can hope successfully to compete in the markets of the world.

DR. POOLE.—It costs from 55 to 90c. per ton to mine coal in Virginia, and the price for carrying it to tide water, including shipment, is $1.35 per ton.

INDEX.

PAPERS :—

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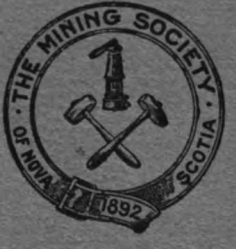

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