PAGES

MISSING

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.... Club ....
OF CANADA

OFFICIAL PROCEEDINGS

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MEETING OF THE CENTRAL RAILWAY AND ENGINEERING CLUB OF CANADA

COMMITTEE ROOM, HOTEL CARLS-RITE,

TORONTO, September 22nd, 1914.

In the absence of the president, the first vice-president, Mr. J. Wright, occupied the chair.

Chairman,—

Gentlemen: The hour has arrived for opening our meeting.

I beg to inform you that the president of the club, Mr. Walsh, is in Chicago attending a convention, and it will therefore be impossible for him to be here to-night.

I might call your attention to the fact that all new members joining the club after October 1st will be paid up members until December 31st, 1915.

Mr. A. R. Taylor will read a paper before the club at the October meeting, October 27th, subject "Refrigeration and Cold Storage."

The next order of business is the reading of the minutes of the previous meeting. As you have all, like myself, received a copy of these minutes, it will be in order for someone to move that they be adopted as read.

Moved by Mr. J. S. Grassick, seconded by Mr. T. B. Cole, that the minutes of the previous meeting be adopted as read. Carried.

Chairman,—

Will now call on the secretary to read the names of the new members.

NEW MEMBERS.

Mr. Jno. A. Real, Electrician, High Level Pumping Station, Toronto.

Mr. M. A. Pymer, Contractor, Toronto.

MEMBERS PRESENT.

T. B. Cole	Jno. A. Real	C. H. Stainton
A. R. Taylor	C. D. Bly	H. Goodes
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W. Evans	J. Reid	C. A. Jefferis
W. R. McRae	W. C. Sealy	J. W. McLintock
G. Baldwin	J. Anderson.	

Chairman,—

I take much pleasure in calling upon Mr. Lamonte who is going to read us a paper to-night. I want you to remember that this paper is open for discussion, and any member, or the friend of any member, is at liberty to ask questions, and the lecturer will only be too pleased to answer them as far as possible.

SELECTION AND CONTROL IN BUYING COAL

BY MR. H. LAMONTE,

Treasurer and Manager, Toronto Testing Laboratory, Limited, Toronto.

Before reading my paper this evening, I have a confession to make. This is positively my first attempt at reading an address in public, and any one acquainted with my naturally backward disposition can appreciate the embarrassing position I am in. I am here this evening as a result of listening to what your friends tell you. When this subject was first broached to me, I said, "Why I have never given an address in public." My friends said, "Go on, go on; all you have to do is get up and read a paper and then answer any questions they ask you." "Well, that sounds easy," but it will be found that that is enough.

In presenting this paper, I wish to briefly outline the scope and object of same. I will attempt to explain and interpret the meaning of the ordinary commercial analysis of coal, how it is effected, its value to the engineer and to the buyer, the calorific value of coal and the effects of the different impurities on the calorific value, the proper selection of coal with regard both to calorific value and furnace efficiency. I will also endeavour to present a reasonable basis on which specifications can be drawn that will be of equal advantage to both dealer and consumer.

The object of this paper is to bring to the engineer and buyer a better understanding of the results to be obtained from coal analysis, both in the selection and purchase, and to bring to the consumer an idea of the advantages to be gained in having chemist, engineer and buyer working in unison.

The geologist tells us that coal is the product produced by the burying out of contact with air of the prolific vegetation of bygone centuries. That this vast vegetation, having undergone certain transformations down through the ages, has resulted in coals varying from the high grade anthracites of the Pennsylvania fields to the lignites or brown coals of the west. Between these extremes we have the grades designated as semi-anthracite, semi-bituminous, bituminous and sub-bituminous, with many variations of each in different localities.

An estimate of the total coal reserves of the United States, while not altogether accurate is at least interesting. The original total coal reserve, within 3,000 feet of the surface, is estimated to have been 3,554,383,400,000 short tons, of which up to the present there has been used something like 15,000,000,000 short tons, or less than one half of one per cent. The present rate of consumption in the United States is about 500,000,000 tons per year, so that even if the present consumption were doubled, the visible supply would last for 3,500 years. This estimate does not include lignite, which is coming more and more into prominence as a source of power through its use in the producer-gas plant, and of which the North Dakota fields alone contain about 500,000,000,000 tons. Added to this the coal reserves of our own country, Nova Scotia, British Columbia, Saskatchewan and the enormous deposits in Alberta, also the vast areas in Alaska, to say nothing of new fields being discovered and yet to be discovered, and we have a total coal reserve on this continent that should keep the wheels moving for a good many centuries.

From the foregoing estimates, it is evident that we need not worry over any immediate shortage in our fuel supply, nor attribute all the economies effected in power plant efficiency to the movement for a conservation of our natural resources, but we must also give credit to the natural desires of the engineering profession to effect these economies for their own sake, as a result of knowledge gained during past years. However, the great incentive for all these economies has been competition, especially in our own province, as exemplified by the distribution of Hydro-Electric Power.

However, the coal problem is still the vital question, for even if there appears to be no immediate shortage in sight, the high grade coals, and the easily mined coals are more rapidly diminishing, which means increased cost for less efficient fuel. Added to this the cost of transportation, duties, etc., we find that the coal bill amounts to quite a formidable affair. When we stop to consider that in our district here, the cost of transportation and duty amounts to about twice the cost of the coal at the mines, and the fact that the transportation rate on inferior coals is as much as on the higher grades, we have a question that both the engineering and purchasing departments may well spend some time on, and be amply repaid for their time and energy in results obtained.

In this work the services of the laboratory for the testing of various coals is a very important item, not alone in the selection of coal, but in the maintainance of the quality of different shipments, and the regulation of prices on the basis of quality, once the contracts have been let. In the testing of coals for steaming purposes, what is known as a proximate analysis is usually made. Now this does not mean that the analysis is approximately correct, but rather it is an analysis that approximates to the treatment which the coal will receive in firing.

First, the moisture is determined by careful weighing of the sample before and after drying. Next, the volatile matter is determined by the ignition of a weighed portion of the dry pulverized coal in a closely covered crucible at a temperature of about 950 degrees centigrade for a period of seven minutes. The volatile matter consists of carbon, hydrogen, oxygen, and nitrogen, which are readily converted into gases at a low heat, and represents the portion of the coal that is burned during the early stages of combustion in the furnace. As some of these gases are inert, and as some are of exceeding high heating value, the volatile matter represents quite a variable factor which cannot be relied upon in judging the heating value of a coal.

The fixed carbon is determined by the continued ignition of the coal, the loss in weight representing the fixed carbon. This does not mean the total carbon in the coal, but rather that portion present in stable form, or that portion that would remain in the coal if it were coked. The fixed carbon is the chief source of energy in all grades of coal.

The ash is determined by the weighing of the mineral residue after all the combustible matter has been driven off.

Sulphur is determined on a separate portion of the coal, one of the simplest methods being the fusion of the coal in a metallic bomb with a mixture of sodium peroxide and potassium chlorate, the resultant fusion being dissolved in water, acidulated with hydrochloric acid, and the sulphur precipitated as barium sulphate by the use of barium chloride. This precipitate, which contains a known weight of sulphur, is collected on an ashless filter. The filter is then burned and the precipitate weighed, the sulphur being calculated from the weight of barium sulphate.

From the foregoing we have a knowledge of the component parts of coal as represented by a proximate analysis, but when it comes down to a comparison of coals as to their relative heating values, we cannot depend altogether on a proximate analysis on account of the variable factors introduced by the volatile matter. In order to arrive at the true heating value of a coal it is necessary to make what is known as a calorimetric test, or in other words, a determination of the actual number of heat units stored in the coal. The accepted standard heat unit in this country is what is known as a British Thermal Unit, or abbreviated a B.t.u. A B.t.u. represents the amount of heat necessary to raise one pound of water one degree Fahrenheit, and in reporting tests on any sample of coal the B.t.u. value is expressed as so many units per pound of coal, thus. A coal represented as containing 14,000 B.t.u. would mean that if all the heat generated in the combustion of one pound of this coal were transmitted to 14,000 pounds of water, it would raise the temperature of same one degree Fahrenheit.

This determination is accomplished by burning a determined weight of the pulverized coal in a metallic bomb, immersed in a known weight of water, and noting the rise in temperature of the surrounding water. The apparatus used in making this determination is manufactured with extreme care and carefully standardized. For instance, the usual thermometer used in this test is graduated in one hundredth's of a degree Fahrenheit, and some as fine as one thousandth of a degree. With careful manipulation this test is accurate within twenty B.t.u., and such should be the case as this determination represents all the heating energy stored in the coal, which in buying coal on a specified B.t.u. basis really means its money value, as shall be shown later on.

I shall endeavour to present some of the effects which the different impurities in coal have on the available calorific value, but first, I would call your attention to the necessity of careful sampling. Unless a representative sample is collected and properly prepared, the laboratory tests will not be indicative of the value of the coal, and in fact may be altogether misleading. In collecting samples from car or pile, care should be exercised to see that the proportion of lump and fine coal existing in the car or pile is maintained in the sample. This is most easily accomplished by taking samples from different cross sections, and in sampling slack the same precaution should be exercised to see that the samples are taken from different cross sections. In all not less than a bushel should be taken from every hundred tons sampled. This sample should be prepared on a clean hard surface, by first crushing the larger lumps until none remain any larger than the size of a walnut. This sample should then be thoroughly mixed by shovelling from one heap to another, then spread in the form of a flat circle, divided into quarters and opposite quarters rejected. The remaining two quarters should then be crushed finer, spread and quartered as before, and the operations continued until about a quart remains, when none of the coal should be any larger than the size of an ordinary pea. This sample is then placed in an airtight jar or can to avoid loss of moisture, and makes a convenient size for the laboratory to handle. These operations should be carried out as rapidly as possible to avoid loss of moisture, and where time must elapse between the collection and preparation of a sample it should be kept in a closed receptacle, a garbage can with a close fitting cover being very convenient for this purpose.

Let us now consider the effects of the different impurities found in coal on its available calorific or heating value. By available heating value, I mean the heat in the coal available, or that should be available for useful work. Under this class we will include moisture, ash and sulphur.

The moisture, or water, in coals exists in two forms, namely, the moisture existing in the coal as mined and which is more or less intimately combined with the coal, and water mechanically held by the coal either from washing or from exposure to the weather during transportation. The amount of water held mechanically by coal varies according to the fineness, lump coal retaining but a small percentage in this way in comparison with slack. It is impossible to draw a distinct line between these two forms of moisture as one will merge into the other, but at any rate, in whatever form present, it has no heating value, but in fact requires heat for its own evaporation, thus lowering the available calorific value, not only by replacing combustible matter, but in requiring heat from the available combustible matter for its own evaporation.

Ash consists principally of silica, alumina, iron oxide and sulphide (iron pyrites), lime, sulphate of lime, magnesia, etc. The composition of the ash as well as the quantity has a marked influence on the available heat received from coal. Coals in which the ash is high in the percentage of iron pyrites it contains, or in which the fusible alkalies are high are more difficult to burn on account of the low temperature at which the ash will fuse, forming a slag which adheres strongly to the grates, seriously affecting the draft, thus retarding the combustion of the combustile matter, also attacking the grate itself with damaging results. The quantity of the ash present also affects the available calorific value, not only because it is inert matter, but on account of the fact that the higher the ash, the more difficult it is to burn out the combustible matter, consequently in high ash coals much of the available energy goes in the ash heap. It has been demonstrated that a coal if it contained 40 per cent. ash, even though the remaining 60 per cent. were all carbon, would be incapable of combustion.

Sulphur exists in coal mainly as iron pyrites, which, as noted under the consideration of ash, tends to form a fusible slag. Sulphur exists also, but usually in small quantities, as sulphate of iron, lime, etc., as free sulphur and in organic combinations. While the great majority of the sulphur is burned in the furnace, its heating value is only about one third that of the carbon which it replaces, and in burning it forms the gas sulphur dioxide, which in the presence of water forms the corrosive agent known as sulphurous acid.

While these laboratory determinations give us an accurate estimate of the relative values of different coals, still when it comes down to the selection of a coal for steaming purposes, we find that it is not always the coal containing the greatest number of heat units that will give the most efficient results in actual work. We have to take into consideration the furnace in which the coal is to be burned. In considering this phase of the subject we must consider the combustible ingredients in the coal. As the effects of the impurities apply practically to all furnaces so also does the percentage of fixed carbon. Therefore it is mainly in the combustion of the volatile gases that individual furnace conditions show a large variation. As stated before, the volatile matter consists of different gases, which being readily volatilized, are driven off during the early stages of combustion. Some of these gases being inert, as for instance, the nitrogen, have no heating value and are nothing more than impurities in the coal, though differing from the other impurities in that they have no deleterious effects. The carbon and hydrogen, or the different hydro-carbon groups are the source of heat in the volatile matter, thus, methane, or marsh gas, which is one of the principal gases, has a heating value of 23,600 B.t.u. per pound as against 14,544 B.t.u. for carbon. It is due to the high heating value of some of the volatile matter that we sometimes find coals of lower fixed carbon content exceeding in heating value those wherein the fixed carbon content is much higher. However, this is rather the exception than the rule in the comparison of coals of the same grade, that is, in the comparison of one grade of bituminous with another, or in the comparison of one grade of semi-bituminous with another. More especially does this apply to coals of the same region.

However, it is only in the furnace under actual working conditions that comparisons of the relative adaptability of different coals can be made. As a rule, the higher the volatile matter in the coal, the harder it is to effect complete combustion, and unless the furnace be adapted to the combustion of high volatile coals a considerable loss will be entailed from the escape of combustible gases up the chimney, and also, in a minor way, by the formation of soot on the cooler parts of the boiler, thus affecting the transmission of heat to the water. In order to arrive at a satisfactory conclusion in regard to the adaptability of a coal, complete boiler trials, in which the boiler and furnace efficiency are determined, may be necessary. However, in cases where the volatile matter in coals are approximately the same, a furnace efficiency test is usually all that is necessary in making a selection. Take for instance a case of two coals, identical in heating value and in price, and wherein the component parts as shown by a proximate analysis are practically the same, should one show a furnace efficiency of 96 per cent. against 92 per cent. for the other, it would not take long to decide which was the more adapted to the furnace, therefore the more economical coal to burn. In fact a continuous record of the amount of ash taken from the fires for comparison with the ash as determined by laboratory tests tends to promote efficiency in the boiler room.

By a comparison of laboratory and furnace tests in conjunction with the price of delivered coal, the purchasing department can easily figure out where to place contracts to the best advantage, but in order to insure the delivery of proper coal, specifications covering same should be made a part of the contract. As noted before the determination of moisture is open to so many variable factors that unless the buyer has facilities for sampling right at the mines, it is impossible to more than approximate to the amount of moisture present in the coal when weighed. While the moisture is an item to be guarded against from the engineer's standpoint, still so far as the purchase of coal is concerned, as long as the weights accepted are mine weights, any attempt to regulate the price according to the heating value of coal, as received, will meet with the strenuous opposition of mine owners and dealers. Many specifications are so drawn that all the coal delivered is paid for on the actual heat units contained in the dry coal, irrespective of any impurities contained therein. This is arranged for by specifying in the contract the net dry B.t.u. to be delivered for one cent, thus: If the contract calls for coal containing 14,000 B.t.u. per pound of dry coal at a price say of $1.50 per ton at the mines, the net B.t.u. would be 14,000 × 2,000, equal to

28,000,000 the B.t.u. per ton and divided by 150c, the contract price, would give us 186,667, the net B.t.u. of dry coal which one cent would purchase. All coal deliveries made under this form of contract are carefully sampled, the samples from several cars being grouped to form a unit of from 100 to 500 tons. These samples are carefully analyzed and the dry B.t.u. value is taken as the basis of settlement for each separate unit. If the coal falls below the guarantee, the price drops accordingly, for instance, if the coal in a certain unit should only test up to 13,500 B.t.u. per pound, one ton would contain 27,000,000 B.t.u., which divided by 186,667, the net B.t.u. to be delivered for one cent, would give us 145 or $1.45, the price to be paid per ton for all coal represented by this sample. On the other hand, should the coal test higher than the guarantee, the dealer will receive the benefit by an increase in the price, thus, should the coal test up to 14,400 B.t.u. per pound of dry coal, the settling price would be $14,400 \times 2,000 \div 186,667$, equal to 154 or $1.54 per ton.

It will be seen from this that this form of contract is quite fair to the dealer, and that it is to his advantage to supply the best grade of coal he can. It is fair to the consumer also to pay a premium for higher grade coal than specified, as the small percentage which a premium amounts to on the delivered price of the coal is more than made up for in increased energy. There is one item though that a contract based simply on the heating value does not cover. As pointed out before, coals running high in ash are more difficult of combustion in the furnace than the low ash coals, and while an increase in the ash will lower the heating value as shown by calorimeter test, still should a coal run much inferior to the guarantee, the decrease in price will not compensate the consumer for the loss in available heating value, nor for the increased cost in removing ashes, transportation on inert material, etc. It would appear that a clause should be inserted specifying the limit of ash which a coal should contain and provision made for an added penalty should the ash exceed the specified limit, and that this penalty should be increased with each per cent. of ash above the specified amount.

In considering all these various items it would appear that in the selection of a coal, it is not always the cheapest coal that is the most economical, nor the coal highest in B.t.u. according to the calorimeter test, but that each individual furnace is a problem in itself, and that in determining the many factors involved therein, the utmost value will accrue to the consumer in having his laboratory and engineering department work together in order to establish standards that will be of value to the purchasing department.

In treating this subject then, I would call your attention to the necessity of thorough confidence between these two branches, a closer co-operation and a better understanding of the functions of each in the determining of the quality of coal necessary to produce the highest efficiency in the boiler room. I might state in regard to specifications that those outlined herein have proven satisfactory both to dealer and consumer in many different localities, and will prove satisfactory wherever the dealer and consumer alike have a thorough understanding of the basic principles that make for efficiency in the coal pile.

Chairman,—

I am sure you are all very pleased with the able address we have had from Mr. Lamonte this evening. The paper is now open for any member to ask any question or questions that he wishes, and I am satisfied that Mr. Lamonte will be able to answer same.

Mr. A. R. Taylor,—

I would like to ask a question of the speaker. When he was referring to the heat units, he stated that a B.t.u. was reckoned from the heat units to raise one pound of water one degree Fahrt., but he did not say at what temperature the water would be. Would it be raising the temperature of the same from 32 to 33 or 39 to 40, at which the density of the water is greatest.

Mr. H. Lamonte,—

The original definition of a B.t.u. was the heat required to raise the temperature of a pound of water one degree Fahrenheit at its greatest density or from 39.1 degrees to 40.1 degrees Fahrenheit. The general accepted idea of a B.t.u. is the amount of heat required to raise the temperature of a pound of water anywhere between 32 degrees and 212 degrees Fahrenheit, one degree, or it does really mean 1-180 of the heat required to raise the temperature 1 pound of water from 32 degress to 212 degrees Fahrenheit.

Mr. A. R. Taylor,—

I would think it would hardly take as many B.t.u. to raise the temperature of 1 pound of water from 179 degrees to 180 degrees Fahrenheit as it would to raise it from 39 degrees to 40 degrees.

Mr. H. Lamonte,—

There would be such a slight difference that it would be difficult to figure it out.

Chairman,—

Mr. Bly is here this evening. Perhaps he can say something on this question.

Mr. G. D. Bly,—

I did not come here with the intention of making any remarks as I did not receive a copy of the paper and therefore did not know exactly on what lines it would be.

However, there is one thing I might say. Very few of the plants in Toronto have a chemical laboratory in connection with same and the average engineer has to select his coal from sight, feeling, or the many other different ways, I suppose every man has a way of his own. If we could get some idea of a reliable way of judging coal more by sight than by laboratory test it would be of benefit. While it is true that there are a number of testing laboratories in the city where coal can be taken to be tested, it costs about $5.00 to get a test made, and in buying coal by the car, you cannot get a test made without running up the price of the coal. Another thing is if a sample of coal is kept about two weeks, the composition will change unless you have an air tight compartment to keep it in, which is a very rare thing in an engine room. Some claim they can tell by looking at coal, the quality, the district it comes from and even the mine.

Mr. H. Lamonte,—

I suppose it is sometimes possible to tell the district from which coal comes. A coal that presents a greyish appearance would probably run high in slate. Indiana block coal has not got the black shiny appearance that the Pennsylvania coal has. As regards selecting coal at sight, being in the testing business myself, it is hardly possible for me to see anything in it (Laughter), but if it can be done I would like to know something about it myself.

In regard to coal analysis. I think that the expenditure in money as far as that is concerned is more than repaid with good results that can be obtained from properly selected coal. As far as analysing coal from a single car is concerned, there are very few firms who do that. The usual thing is to group samples from several cars, each sample representing a unit of from 100 tons to 500 tons. Single car analyses are necessary when making a selection between different coals before placing contracts.

Mr. G. D. Bly,—

The trouble we have with the coal dealers is—we make a contract at the first of April and get a few cars of good coal and others not so good. We cannot spend $5.00 to get the coal tested every month, and the dealers take an advantage of us in that way. In the winter we get a great deal more moisture in the coal, as the same is subjected to snows and rains, and it is then very difficult for the engineer to select coal that is going to give good results. I fail to see how some men can tell the kind of coal they are getting from merely looking at it. I saw in the paper some time ago where the city was using Pocohontas coal, and the number of heat units were averaging around 16,000. I would like to know how it is that the number of heat units in this coal are so high.

Mr. H. Lamonte,—

Pocohontas is a very select grade of coal and generally runs about 15,000. I have never known it to run as high as 16,000 and the average is about 14,500. Pocohontas is what is known as semi-bituminous, smokeless coal and the price prohibits most firms from buying it. It often runs at 15,000 heat units, but as far as 16,000 or 17,000 goes, I have never seen it.

Mr. Chas. Russell,—

I had some coal in a short time ago—the dealer did not mention any name to it, but when we got using it we found it was chiefly composed of ashes, and no one can get good results with coal that has a large percentage of ashes. I might say that I fired with Welsh coal on the London and North Western Railroad in England some years ago, and it was about the finest coal I have ever used. The next coal to it I am confident is the Pocohontas. I claim that the Pocohontas coal is the finest that is brought into this country. With this other line of coal you bring in about three wheel-barrowfuls and have about one and a half wheel-barrowfuls to throw out, and if you happen to have the Herring-bone grate bars it is a case of put out your fire, clean out and fire up again. Of course, the drop grate that they have now helps out considerable. I claim that although the first cost of the Pocohontas coal may seem exorbitant, in the long run it is the cheapest coal you can buy.

Mr. H. Lamonte,—

Regarding Pocohontas coal. This is of course a semi-bituminous coal of very select grade, but there are other fields down in that district that pan out nearly on the same basis as Pocohontas. There are semi-bituminous fields in Penn., Md., W. Va. and Va. The Pocohontas fields are in Virginia, the New River in West Virginia, while Cumberland in Maryland, and several counties in Pennsylvania, produce semi-bituminous coal. You generally find anthracite coal the highest in ash. So far as slate is concerned, slate is generally found in mines as a layer between different coal, and it depends on the care that is taken in getting the coal out the amount of slate that will be found in the coal.

Mr. T. B. Cole,—

This coal question has always been somewhat of a mystery to me and I do not know but what the mystery has been deepened rather than made clearer this evening. While these papers are very nice and interesting to hear, and I think we should have more of them, yet there are some points of practical interest to engineers on the coal question that we should endeavor to get cleared up while we are on the subject. We are supposed to have a considerable amount of Pocohontas coal, yet we have had the smoke inspector down more than once complaining that we were making too much smoke. My experience has been that we engineers have to take whatever kind of coal is given us. Down at our place we use two or three different kinds of coal for different purposes. Pocohontas coal which is supposed to be a smokeless coal we use for some of our ovens; lump anthracite for others, and pea anthracite we use for our producing gas plant. My experience has been that we engineers have to take what coal is supplied us.

A question I might ask, and I think it is an important one. Is a certain amount of moisture in coal detrimental to it? I have also heard that hydrogen in coal is an advantage to it and will increase the heating value.

Mr. H. Lamonte,—

Hydrogen when present in combination with carbon is an advantage. Any good effect the moisture has is mechanical. It is true that once the moisture or steam is disassociated the hydrogen burns with great heat, but in order to get hydrogen from steam you have first got to expend the same amount of energy in order to get the hydrogen from the steam, as you will get in burning it again. You will see you have to expend more energy in separating the hydrogen from the water in order to make use of it, as you must first convert the water into steam, that it makes it hardly worth while to burn hydrogen when present as a part of the water.

Chairman,—

I think, gentlemen, that we are wandering away from the subject under discussion to take up matters which are of interest, but tend to place Mr. Lamonte who was kind enough to come and read a paper before us this evening in an embarrassing position.

Mr. G. D. Bly,—

I think that one of the troubles of the engineer is that the coal for the engine room is bought at the office and the engineer does not have anything to say about it. The dealer will say to the purchasing agent, "I can give you that coal for five cents per ton less than you have been paying for it;" the purchasing agent says:—"You are just the man we have been looking for. We'll take that offer." The coal is sent down to the engine room. The engineer will probably raise a little objection about it, but the office will say, "You've got the coal there and you might as well use it." Pocohontas coal is rather dear, and I do not think the results obtained from it are sufficiently higher than those obtained from the ordinary coal to warrant paying the price for it. When it comes to a question of dollars and cents, the line is drawn on Pocohontas coal, except in the question of smoke.

To get away from the subject a little, I think we should take up the question of burning coal so as to obtain the best results. If we burn coal with one atom of oxygen we only get 4,500 B.t.u., but if we add two atoms of oxygen we get 14,500 B.t.u. This is where so many of us fall down in burning coal. If we watched the furnace and the fireman more closely we would get better results. My experience has been that a good fireman, no matter what you have to pay him within reason, will pay for himself in a short time.

Mr. J. S. Grassick,—

I think we will all be giving this shovel question consideration before the winter is over. I take much pleasure in moving that a vote of thanks be extended to Mr. Lamonte for the excellent paper he has taken the trouble to prepare and read before us to-night.

Mr. T. B. Cole,—

I second that motion.

Chairman,—

You have heard the vote of thanks. All in favor please signify in the usual manner. Carried.

Mr. H. Lamonte,—

I certainly appreciate the kindness of the members and the honor of having read a paper before this club to-night. The object of my paper has been to plead for the co-operation of the purchasing department, the engineers and the laboratory in the selection of coal, and if this were brought about I feel that the outcome would undoubtedly be better results.

Mr. J. S. Grassick,—

I would like to ask, are any of the members of the club at the front, or at Valcartier? If there are I think we ought to communicate with them to show them that we remember them.

Mr. C. L. Worth,—

None that we know of.

Mr. F. G. Smith,—

I have a suggestion to make which it seems to me is a very important one. As has been said this evening, times are hard and doubtless there are a number of our members at the present time out of employment. It would undoubtedly be of great benefit to them if the club instituted a sort of a labor bureau, and the secretary communicate with all the members and request those who are unemployed to send in their names, addresses and nature of their previous employment, and those members of the club who are employers of labor advise the secretary when they require a man. In this way the club would be of great benefit to those members who get out of employment. I think this suggestion should be acted upon as soon as possible, and I hope that it will be brought to the notice of the Executive for consideration.

Mr. J. S. Grassick,—

I move that we adjourn.

Mr. T. B. Cole,—

I second the motion. Carried.