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OFFICIAL PROCEEDINGS

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PROCEEDINGS OF THE CENTRAL RAILWAY AND ENGINEERING CLUB OF CANADA MEETING.

COURT ROOM NO. 2, TEMPLE BUILDING,

TORONTO, November 26th, 1912.

Past President, Mr. G. Baldwin, occupied the chair.

Chairman,—

Unfortunately our esteemed president, Mr. Bannon, is a little under the weather to-night, consequently he will not be here and our vice-president, Mr. Taylor, I understand has got sickness in the house and it is impossible for him to be here, which explains why I am acting as president to-night.

The first order of business is the reading of minutes of previous meeting.

As every member of the Club has received a copy of the JOURNAL which contained the minutes of the last meeting it will be in order for someone to move that they be adopted as read.

Moved by Mr. Wickens, seconded by Mr. Herriot that the minutes of the previous meeting be adopted as read. Carried.

Chairman,—

The next order of business is the remarks of the president. As I was not aware until a few minutes ago that I was going to act as president to-night, I have no remarks to make to you. However, there is one thing I would like to see and that is a larger turn out of members at the meetings. This remark does not, of course, refer to those who are present this evening, as I think most of those present attend regularly, but I think if you would just mention to other members and try and get them to attend we would have better discussions on the papers.

The next order of business is the announcement of new members.

NEW MEMBERS.

J. A. Day, Mgr. Canadian Cleveland Air Drill Co., Toronto.
C. Moffat, Patternmaker, Watson Pattern Works, Toronto.

E. Holland, Fitter, Gurney Foundry Co., Toronto.
J. Staines, Machinist, Gurney Foundry Co., Toronto.
M. B. Morgan, Toolmaker, Gurney Foundry Co., Toronto.

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J. E. Rawstron
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A. M. Wickens
C. Herring
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W. M. McRobert
J. J. Francis
J. Herriot
G. H. Boyd
G. Milne
R. Shepherd
J. S. Grassick
T. B. Cole
W. C. Sealy
R. Pearson
L. S. Hyde

Chairman,—

The next order of business is the "Reading of papers or reports and discussion thereof."

We have with us to-night an old friend of ours, Mr. W. M. McRobert, the late Chief Engineer of the Canada Foundry Co., and now Chief Engineer for Gunns' Limited, and his subject for to-night is "Mechanical Refrigeration." For my own part I am quite satisfied that he will be able to give you a great deal of information along these lines. I know for a fact he is a past master in the art of refrigeration. Last winter we had some very cold days and he did not warm us up any too much, and I feel that he is quite capable of handling this subject to the satisfaction of everybody.

I will now call on Mr. McRobert to read his paper.

MECHANICAL REFRIGERATION.

BY WILLIAM M. MCROBERT, CHIEF ENGINEER, GUNNS LIMITED, TORONTO.

It is not my intention in this short paper, which I am about to give, to enter into any scientific formula in connection with refrigeration, but to give only such figures as practical experience in the care of refrigerating plants require. However, it is necessary to make a few introductory remarks in order to give a somewhat clearer interpretation on the subject.

REFRIGERATION.

As the process of refrigeration is merely a transfer of heat from the space or goods to be cooled, to some convenient medium, we must look at some of the properties of heat, before taking up the details of refrigerating apparatus.

HEAT.

Heat is as much an attribute of matter as weight, form, or size. Everything must contain a certain amount of heat which we will call, for convenience, its temperature. The amount of heat contained in any body is controlled by surrounding conditions. Heat, like water, always flows down hill. If two bodies of different temperatures are placed together, the heat of the warmer will pass into the colder until both bodies are of the same temperature. The first problem to be solved was to find some agent of sufficiently low temperature to start the heat on its down-hill course. In the early days of cold storage this was accomplished by natural ice, and acted sufficient for all conditions above the melting temperature of ice, but as the business of cold storage increased, and applied refrigeration expanded, the comparatively high temperature of ice refrigeration, and the moisture contained in the air by the actual melting of the ice became objectionable. In looking for some means of transferring heat to a very low temperature scientists turned their attention to "latent heat," and these two words are the whole sum and substance of mechanical refrigeration. The latent heat of ice is 142 British Thermal Units, that is to say, one pound of ice at 32°F. will require 142 B.T.U. to melt it into water at 32° F., or 142 B.T.U. must be extracted from water at 32° F. to freeze it into ice at 32°.

Refrigerating plants are always rated in tons capacity, that is, a given number of tons refrigeration per day of twenty-four hours. Before the advent of mechanical refrigeration was turned to practical use, it was natural to rate a machine in tons of ice melting capacity. So, if a machine is of ten tons' capacity that implies that it will produce as much refrigeration as the melting of ten tons of ice.

In order to ascertain the quantity of refrigeration to be obtained from one ton of ice, we must refer to its latent heat. We found it required 142 units of heat to melt one pound of ice at 32° to water of equal temperature, so one ton re-refrigeration = 142 B.T.U. × 2,000 pounds, or 284,000 B.T.U.

OPERATION OF A REFRIGERATING MACHINE.

Apparatus designed for a refrigerating unit is based upon the following series of operations:

Compress a gas or vapour by some external force, then relieve it of its heat so as to diminish its volume, next cause this compressed gas or vapour to expand, so as to produce mechanical work, then lower its temperature. The absorption of heat at this stage by the gas in assuming its original condition, constitutes the refrigerating effect of the apparatus. A refrigerating machine is a heat engine reversed. The efficciency depends upon the range of temperature. Unlike the heat engine the refrigerating machine has the greatest efficiency when the range of temperature is small and when the final temperature is raised.

If the temperatures are the same, there is no theoretical advantage in employing a gas rather than a vapour to produce cold. Air offers the double advantage, that, it is to be obtained everywhere, and we can change the higher pressures at will, independent of the temperature of the refrigerant. But to produce a given useful effect the apparatus must be of large dimensions. The difference between a steam engine and a refrigerating machine is, a steam engine receives heat from the boiler, converts a part of it into mechanical work in the cylinder, and throws away the difference to the condenser, or other suitable place. The ammonia in a compression refrigerating machine receives heat from the brine tank, or cold rooms, receives an additional amount of heat from the mechanical work done in the compression cylinder, and discharges the sum into the condenser. The efficiency of the steam engine = work done ÷ heat received from the boiler, the efficiency of the refrigerating machine = heat received from the brine tank or refrigerating chamber ÷ heat required to produce the work in the compression cylinder. The most common agents employed in the process of mechanical refrigeration are ammonia, carbonic acid, and air.

THE DIRECT EXPANSION SYSTEM OF AMMONIA REFRIGERATION.

In this paper we will deal principally with the direct expansion system of ammonia refrigeration. There are only four parts to be considered and remembered.

First. The evaporating or expansion side of the plant, that is the cold storage rooms, where the ammonia is expanded from a liquid to a gas.

Second. The ammonia machine or compressor, where the cold gas is drawn from the expansion coils and compressed to a pressure sufficiently high to enable it to be liquified again at the temperature of the condensing water.

Third. The ammonia condenser, or liquifier where the hot dense gas from the compressor is cooled and returned to its liquid state.

Fourth. The liquid receiver where the ammonia is stored ready for distribution to the coils in the various cold storage rooms. In order that we may understand the principle of ammonia refrigeration more clearly we can imagine an outline sketch of same.

(A)—Represents the expansion coils (or cold storage rooms).

(B)—The compressor, which pumps the expanded ammonia from the coils in the rooms, and discharges same to the condenser.

(C)—The condenser, which condenses the ammonia from a gas to a liquid.

(D)—The liquid receiver, which receives the liquified ammonia from the condenser.

Ammonia is one of the best known extractors of heat, and the expanded ammonia gas passing through the coils in the various cooling chambers absorbs the heat from its surroundings and holds the rooms at any desired temperature. Ammonia will boil in the open air at a temperature of 28° below zero. The quicker the expansion the lower will be the resulting temperature. Each set of expansion coils is provided with a valve to regulate the quantity of ammonia desired to be fed to the coils. We can divide the refrigerating plant into two parts, one high pressure and the other low. The condenser and liquid receiver being the high pressure side, and the expansion coils the lower pressure.

The low pressure side of the system is really where the actual performance of refrigeration is done. If we could find any evaporative fluid cheap enough that waste was of no object, and let it flow through the coils to the open air, the whole process of refrigeration would be completed. Ammonia really absorbs heat just as a sponge absorbs water, and before it can be made to do work over and over again, the heat must really be squeezed out of it, just the same as water is squeezed out of a sponge.

This is accomplished by subjecting it to a high pressure in an ammonia compressor, which discharges it into a condenser, where the heat is squeezed out.

DANGERS OF AMMONIA.

Although everyone here is well aware of the damages and trouble which exist from steam joints blowing out, or any serious leakage of steam, probably all are not acquainted with what might happen if an ammonia joint blows out. In the case of steam the only danger is in getting scalded, which in itself is enough, but in the case of ammonia the danger is twofold, as in addition to scalding there is always a possibility of suffocation. I know of a case in my experience which occurred on a ship in mid ocean, where a cylinder burst on the ammonia compressor, and the fumes would have suffocated everyone on the ship, but for the presence of mind of the officer on watch, who turned the ship to the wind and allowed the ammonia to escape in another direction. Happily ammonia explosions do not often occur. Even the slightest leak of ammonia in an engine room makes its presence very severely felt.

THE PISTON ROD STUFFING BOX.

Probably no part of the ammonia compressor has received so much attention as the piston rod stuffing box. The piston rod of a double acting compressor has to withstand a high and low temperature alternately, the cold gas from the expansion coils and hot gas after compression. The stuffiing box of an ammonia compressor is often as much as twelve inches deep. This is really divided into a double compartment, there being about four or five turns of packing in the bottom of the box, then an oil sieve or lantern as it is named, then other four or five turns of packing next the gland. The object of this lantern (which is connected to the suction side of the machine) is to collect any ammonia gas which has passed the first turns of packing, and it also acts as an oil reservoir. A great deal of trouble is experienced with ammonia piston rods leaking and for some reason the rod becomes very easily scored after which it is almost impossible to prevent leakage.

There are a large number of different makes of ammonia packing on the market, many sold at a price much in excess of their actual value. Every engineer has his own particular idea as to what is best, but of course conditions vary in almost every instance. I know of a case in mind where a company put a set of a metallic packing into an ammonia compressor on a thirty days' guarantee, and before the end of that time the rod had commenced to score slightly and before another month had passed the piston rod was so badly cut that it had to be taken out and turned down. The packing itself was completely perished, and showed to be of cheap construction, being simply a piece of cotton rope with a filament of babbit or some similar metal cast around it.

THE AMMONIA CONDENSER.

For many years the ammonia condenser was the subject of many experiments, but the many types have been narrowed down to two, the atmospheric and double pipe condensers. We will illustrate the atmosphere condenser as the first example. They are divided into two classes, namely, top and bottom supply, but the former is the most widely used. The condenser is divided into a series of elements or stands all directly connected with the discharge pipe from the compressor by means of a header, each element or stand being controlled by a valve of its own, so as it can be cut out from the others as required. About twelve sets of stands usually constitute the average size condenser. The method of operation is the hot dense gas from the compressor enters at the top of the condenser, which is simply a series of pipes connected together to comprise one large unit, and comes in contact with the cooling water which flows over the condenser and causes the ammonia to be liquified when it then passes into the liquid receiver to be stored, ready to be fed to the expansion side of the plant as required. This type of condenser renders it necessary to keep the ammonia at a very high temperature. In some top supply condensers an auxiliary condenser is employed, the hot gas from the compressor first passes through this, and is partly cooled with the water which has already performed its duty in the main condenser. After passing through the auxiliary condenser the gas is then delivered to the top of the main condenser and meets with the original supply of cold water. This arrangement has been found to give about 25 per cent. more efficiency over the single condenser.

THE DOUBLE PIPE CONDENSER.

This type of condenser is formed with two sets of pipes, one inside of the other. The general rule is to use 1¼ inch pipe for the inside and 2 inch for the outside, the former being the water supply and the latter the ammonia, the water and the ammonia passing in opposite directions. In the vertical condenser of this arrangement the ammonia gas enters at the top and flows down through the annular space between the two pipes, flowing to the receiver tank at the bottom in a liquid state ready to be expanded in the system. The water, of course, will enter at the bottom and discharge at the top. This in some respects is a superior arrangement to the atmospheric condenser on account of the ammonia gas coming into such intimate contact with the condensing water. Under summer conditions when the temperature is high the double pipe condenser will operate with about 40 per cent. less water than the atmospheric type. The double pipe condenser is usually placed in the engine room near the compressor, thus making the discharge pipe very short, thereby reducing the friction of the gas passing to the condenser.

The water bill in connection with a refrigerating system is naturally a very expensive item, as it practically requires one gallon of water per minute per ton of refrigeration, the temperature of the condensing water being based at 70 per cent. Therefore, a machine of 300 tons' capacity would require 300 gallons of water per minute. If a large quantity of water is used a cooling tower is sometimes employed, but in hot weather this is not always satisfactory, as for every 10 per cent. the condensing water is raised above 70 per cent. the amount of water will have to be increased 50 per cent.

THE AMMONIA COMPRESSOR.

There are so many makes of ammonia compressors in use that it is impossible to specify any particular type, but anyone who is acquainted with the ordinary air compressor, may form an approximate idea of the usual style of an ammonia compressor. Needless to say they should be as simple as possible and have few working parts. The suction and discharge valves should be made of hard tough steel combined with a minimum of lightness. The suction valves are usually made with a series of small vents which tend to act as a cushion. This prevents the valve lifting too suddenly at the end of the stroke as the gas cannot escape from the cushion pocket fast enough to allow the valve to hammer against the compression stop. Some builders of single acting compressors put the valves in the piston. This has been found to work very satisfactory as when the piston leaves the cylinder head end on its suction stroke, it really leaves the valve behind it as it were, and the momentum of the valve will be sure to close promptly at the very commencement of the return or compression stroke. This prompt opening and closing of the valves will give a maximum efficiency, as the capacity of an ammonia compressor depends upon the number of pounds of ammonia it can pump from the expansion coils. The discharge valves unlike the suction are found to work best without cushioning as long as they are provided with a strong spring and have sufficient lift. As the piston reaches the end of the stroke it is travelling somewhat slower and as the quantity of ammonia gas is gradually being discharged from the cylinder, by the time the piston has reached its limit of travel, the valve is entirely closed. This greatly increases the life of the valve and also prevents any liability of any of the gas which has already been discharged from coming back in the cylinder, when the piston starts on its return stroke. This is very likely to happen if the discharge valve is cushioned or is late in seating.

THE INDIRECT EXPANSION SYSTEM OF REFRIGERATION.

The indirect system of refrigeration is successfully employed when a purity of air and even, but not too low, temperature is desired. This is accomplished by placing a series of coils in a loft or gallery above the rooms desired to be cooled. These coils are connected with the remainder of the refrigerating plant and have ammonia circulating through them just as in the direct expansion system. By means of a large fan the air is then drawn out of the room and discharged over the above mentioned ammonia coils and this cycle being continued the air is kept perfectly pure and at a uniform temperature. In large plants the coils are kept wet with a solution of chloride of calcium brine. The brine is pumped from a tank immediately below the coils and allowed to drip over same in practically the same manner as the water flows over an atmospheric condenser, but of course in a lesser degree. This keeps the ammonia pipes free from frost which will necessarily give increased efficiency. Care must be taken to keep the brine at sufficient density as unless this is done it will not absorb the moisture from the air when coming in contact with the coils. A solution of chloride of calcium can be kept liquid at several degrees below zero providing a maximum density is used. The air to the rooms with the indirect system is sometimes conveyed by means of large wooden ducts each having an arrangement of slides which can be opened or closed as desired to maintain the required temperature.

ARTIFICIAL ICE MANUFACTURE.

The demand for artificial ice has of late been in excess of the supply and various means are adopted in the manufacture of same. What is known as the can system is the most common method employed in artificial ice making. A number of cans of oblong shape each of sufficient capacity to hold about one hundred pounds of ice are placed full of water in a tank. In this tank are contained a series of ammonia coils, which are immersed in a solution of chloride of calcium brine. The depth of the brine in the tank is sufficient to cover about three-quarters of the whole can, which has been previously filled with water for the purpose of being frozen into ice.

The cold brine in the tank is kept in continuous circulation either by means of an agitator or by a pump, and with the ammonia expanding in the refrigerating coils in the tank, and the brine coming in continual contact with same, the process of ice manufacture is completed. To produce one ton of ice the amount of ammonia circulated through the expansion coils in the freezing tank must be sufficient to cool 2,000 pounds of water from its original temperature, say 85 per cent. to the temperature of the tank, which we will say is 14° F. and in addition to this extract 142° of latent heat therefore:

$$\frac{85^\circ - 14^\circ \times 142 \text{ B.T.U.} \times 2{,}000 \text{ lbs.}}{284{,}000 \text{ B.T.U.}} = 1\tfrac{1}{2} \text{ tons refrigeration.}$$

There are generally so many losses incurred due to the leaving the covers off the freezing tank, etc., that a fair average of ice manufacture may be accepted as half the refrigerating capacity of the machine. The longer the ice takes to make the clearer it will be, and the higher the temperature of the tank is maintained without actual loss of efficiency the more economical will be the operation.

INSULATION.

In refrigeration practice the matter of insulation is perhaps of the most importance as the rooms in which goods are stored must be kept at as even a temperature as possible, as the variation of a degree or two might mean the partial or total loss of a large amount of valuable property. Asbestos, mineral wool, and such material is usually employed for insulating steam mains, boilers, etc., but unfortunately they are practically of no value in cold storage on account of their absorption of moisture.

Scientists for many years turned their attention without success to the ideal insulation, i.e., dead air, which if it could be permanently confined in an airtight compartment would prove of the greatest value to science. An insulation to be of any value for refrigerating work must be absolutely impervious to moisture, and practically the only material which has met with any degree of success in this particular line is cork. Several methods have been attempted to supersede cork as an insulation on account of its being so expensive, but they have nearly all wholly or partially failed to attain the degree of perfection warranted for them. Cork is regarded as the only efficient agent at present in service. Under a powerful microscope it is of honeycomb appearance, its air cells are closely sealed and prevent the passage of moisture, as can be seen from a cork in a bottle. Cork is used in its granulated form and in compressed sheets, which are made by mixing the granules with a kind of cement and putting them through a baking process. In selecting cork sheets it is well to remember that the cork is the insulation and the more cork and less cement there is, the more value it will be as a non-conductor. The principal parts of a cold storage system to be insulated are the floors, walls, suction and liquid pipes. In several instances brick walls have been insulated by building them of cellular form, leaving a space of about three inches, and filling this with pitch or asphalt and finishing inside with cement. The asphalt prevents the moisture from passing through the wall, but apart from this it is of little value. The usual method of applying cork sheets to floors is: The floor is first made as dry as possible, then a layer of waterproof paper is laid on same, the cork sheets or slabs are then dipped in a hot preparation of asphalt and laid closely together on the floor after which hot asphalt is poured completely over the whole surface and as it runs down between the joints of the segments it forms practically one continuous sheet. These sheets are two inches thick, two layers being generally laid and the whole finished off with a covering of cement of about three inches thick. A great deal more can be said about mechanical refrigeration, but time will not permit, therefore I have confined myself to what is practically a mere outline of the process, and I trust you will overlook any mistakes or omissions which I may have made in this paper as it has been written in a somewhat hurried manner.

Chairman,—

I am sure you have all been very pleased with the interesting paper Mr. McRobert has given you.

I will call on Mr. Cole to start the discussion and I am sure Mr. McRobert will be only too pleased to answer any questions that may be asked.

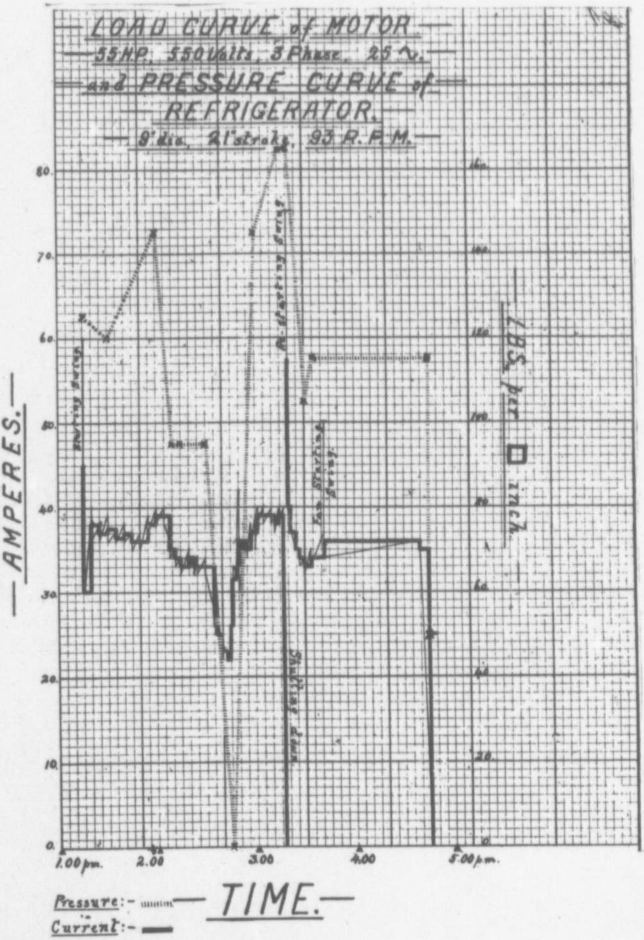
Mr. Cole,—

The refrigeration end of this paper is not so much in my line. The power in connection with the plant is the part that concerns me most. When we were installing a plant sometime ago we had a little difficulty in getting the necessary power to drive the plant. We were told that we would require a certain h.p., but to make sure we put in a motor 5 h.p. larger. After I got the plant going, I took a curve, a copy of which I have brought down with me (see cut page 29), which I think will be interesting to the members as it shows that we have about 30% more power than we require. Of course this is only an experimental curve, and was not taken when the plant was running in an ordinary way.

The paper has been very interesting and instructive to me, and I want to thank Mr. McRobert personally for the paper.

Mr. McRobert,—

I should think from your curve that you were workin



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against a high head pressure on the condenser which would necessitate an increased load on your motor driving the ammonia compressor.

It usually takes about 1½ h.p. to produce a ton of refrigeration.

Mr. Ellis,—

I would like to ask what pressure you have got to have to compress the ammonia to get it back into a gas from the liquid state, and what means you have of doing it?

Mr. McRobert,—

This entirely depends upon the amount of cooling water available for ammonia condensing purposes, the lower the head pressure and the higher the suction pressure is maintained, the greater will be the efficiency of the refrigerating machine. The usual pressure required to change the liquid ammonia to gas, in actual practice is between 140 and 175 lbs., this is accomplished on the discharge side of the compressor.

In regard to insulation. As everyone knows soot is probably one of the best insulators, and I have wondered if it could not be put to some practical use as an insulator in regard to refrigerating plants. For instance, if you took the soot out of the back of the boilers and put it into canvas envelopes, about 2 inches thick by 10 inches wide by two feet long, and pressed it in tight and sealed it up, covering the envelopes with some material to make them impervious to moisture, would it not be possible to make some practical use of it in this way. I might say that 1-5 of an inch of soot is equivalent to 1 inch of asbestos as a non-conductor. I should like to hear someone give his opinion on this matter.

Mr. Wickens,—

It seems to me that while there is no question about soot being a first-class non-conductor, either for heat or cold, in this particular case it would be very difficult to make an envelope to hold it to make it serviceable as an insulator, if you pressed it very hard you would take part of its insulating properties away. One reason why it is a good non-conductor, is because of the air between the particles and if you pressed it too hard you would get less air between the particles. Then again, if it was not pressed very tight you would have great difficulty in getting it to hold together, that is to get your envelopes in anything like uniform shape, as soot will not adhere. Soot also has a great affinity for water, and it would appear to me that the envelope you would have to make so that it would be impervious to moisture, would be too expensive for practical use.

Mr. McRobert,—

My idea was to form the so-called envelopes and fill them with soot to represent an ordinary sheet of cork insulation, and after same was put on the walls or floors of a cold storage chamber, to cover them over with a suitable thickness of cement. In regard to the expense, you take pipe covering for a 3 or 4 inch pipe, and if you have to cover many lengths of this size you soon have an enormous bill. Has anyone else any opinion on this question?

Mr. Mills,—

When working with soot if you mix a little vinegar with it you can bring it into a paste, and you can then do almost anything with it. I have used it in buildings and put it on the walls an inch thick.

Mr. Sheppard,—

I would like to ask Mr. McRobert, his opinion of wet and dry compression.

Mr. McRobert,—

There is a great difference of opinion in regard to this Some favor dry compression, but personally I am in favor of wet compression. It is not very much trouble, although I must say that I have not had very much experience with dry compression.

It may be as well to give a slight explanation of what Mr. Sheppard is referring to about wet and dry compression. With the dry compression, the ammonia cylinder is kept cool by the ordinary means of circulating cold water through a jacket on the cylinder.

In the wet compression system a certain amount of unexpanded liquid ammonia is returned to the compressor in conjunction with the gas from the coils, which will naturally keep the cylinder at the required temperature.

Mr. Wickens,—

I think that we should give Mr. McRobert a very hearty vote of thanks for this paper. I have heard several talks upon refrigeration, but I personally know very little about the subject. All my life has been spent in making heat and trying to get as much heat as possible from a given quantity of coal, and the system of refrigeration is the opposite, and seems to me is working backwards. However, refrigerating plants are becoming very common and it is up to every engineer to know something about operation of refrigerating plants. When an engineer has a leaky joint in his steam pipe he goes right up to it and plugs it up, probably with a shingle, but in a refrigerating plant it seems to me that the engineer would need a pretty good set of lungs to stand a leak of that wicked gas.

However, I think as far as stationary engineers are concerned, that every man should try and learn as much as possible about refrigeration, so that he can understand the theory and working of the refrigerating plant and after he gets a theoretical knowledge it would not be long before he could carry it out in practice.

As I said before Mr. McRobert's paper is one of the clearest explanations I have ever listened to and I have very much pleasure in moving him a hearty vote of thanks.

Mr. Fletcher,—

I second that. Carried.

Chairman,—

Mr. McRobert, it has been moved by Mr. Wickens, and seconded by Mr. Fletcher, that the hearty vote of thanks of this meeting be tendered to you for the excellent paper you have given us to-night.

Mr. McRobert,—

Allow me to thank you for the hearty vote of thanks you have tendered me for reading this paper.

I know I have not succeeded in enlightening you to any great extent on the question of mechanical refrigeration, but I know there are many members of our Club who have never yet given a paper, who could with a little trouble submit excellent subjects for the benefit of the Club. It is rather hard on the secretary, when he continually has to go outside our own ranks in order to get people to prepare papers for our meetings, especially when we have so many experienced mechanical men of our own.

I thank you gentlemen for your kind attention.

Chairman,—

I think we will not have any difficulty in getting all the papers we want. I was instrumental last meeting night in getting a promise from Mr. Taylor to give us one on boiler-making and our next paper, which is to be given by Mr. Herriot, I was instrumental in getting.

There is Mr. Cole, he enters into the discussion on almost all the papers we have. He is a very intelligent man, and I am sure Mr. Cole, with a little persuasion, will give us a good paper before long.

As I have already said, Mr. Herriot, who is the general storekeeper of the Canada Foundry, will read us a paper at the next meeting on the method of handling stores. This is something we are all interested in. Stores are something that we have in whatever business we are dealing with and I feel satisfied that his paper will be an excellent one, as he has been in this business upwards of 20 years, and I am sure you will all listen to something worth hearing along the lines of storekeeping.

I want to call the attention of the members to the fact that as our next meeting night falls on Xmas Eve, we have changed the date of the meeting to the third Tuesday, the 17th of December, instead of the 24th, so that the meeting will be a week earlier next month.

This being the meeting preceeding the last meeting of the year according to Section 10 of the Constitution of the Club, it will be necessary to-night to elect a Nominating Committee to make a selection of members for officers for the ensuing year to be submitted at the next meeting for the approval of the members present. This method saves a lot of time, as there are a large number of members who attend the meetings who are not acquainted with the other members, and it is the business of this committee to arrange a list of members who they think are best suited to carry on the work of the Club, of course you understand that this list does not have to be accepted, and any member present is at liberty to nominate anyone he wishes for any of the positions.

The following members were elected to act on the Nominating Committee:—

Mr. Jas. Wright, Foreman, Gurney Foundry Co., Toronto.

Mr. J. E. Rawstron, Storekeeper, Canada Foundry Co., Toronto.

Mr. J. Herriot, General Storekeeper, Canada Foundry Co., Toronto.

Mr. C. G. Herring, Chief Draughtsman, Consumers' Gas Co., Toronto.

Mr. T. Ward, Steamfitter, Consumers' Gas Co., Toronto.

Chairman,—

There is one thing further, I would like to make a motion.—

"That this Club extend its sympathy to Mr. Jefferis in his recent illness."

As you know he has been very ill for sometime and he has been a very good member of our Club, and I think it is up to us to show him that we appreciate his services to the Club, and sympathize with him in his sickness and we shall be glad if the secretary will convey our sympathy to Mr. Jefferis in a letter.

Mr. Tomlinson,—

I second that. Carried.

Chairman,—

Before we adjourn I would like to mention that one of our members, Mr. George Milne, has been appointed as general foreman of the Canada Foundry. I am sure you will all be glad to know this.

Moved by Mr. Fletcher, seconded by Mr. Herriot, that the meeting be adjourned. Carried.