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. THE CENTRAL . .  
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OF CANADA

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OFFICIAL PROCEEDINGS

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

Prince George Hotel, TORONTO, October 19, 1909.

The President, Mr. Jefferis, occupied the chair.

Chairman,—

The first order of business is the reading of minutes of the previous meeting. You have all been supplied with a copy of the Club's Journal, giving the minutes of the last meeting, it is therefore in order for someone to move the adoption of same as read.

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

Chairman,—

The next order of business is the remarks of the President.

Chairman,—

I want first of all to tell you a secret, and I hope you will all keep it. At the meeting of the Executive Committee it was decided that, in view of the fact that you all behaved so well at Jackson's Point last summer, that another social gathering be held sometime in November for members and any prospective members. You will receive notice of this in the course of a few days and our Reception Committee has been instructed to go ahead and make arrangements, so that you can all look forward to having a very delightful evening in the near future. It will consist of Progressive euchre, songs, music, etc.

The paper to be given at the next meeting on November 16th is "Gas engines, their origin and their commercial use," by Mr. G. M. Henderson, Mechanical Engineer, Toronto. You can therefore get posted up on gas engines in the meantime.

The Secretary has also asked me to request any member present or if he has a friend who will give us a paper, to notify him of that fact. He has a few papers ahead, but would be glad to hear of some more.

I will now ask the Secretary to announce the new members.

NEW MEMBERS.

Mr. A. E. Nourse, Assistant Engineer, Expanded Metal and Fireproofing Co., Toronto.

Mr. M. A. Humber, Apprentice Instructor, Grand Trunk Railway, Stratford.

Mr. J. H. Shales, Consulting Engineer, Elevator Specialty Co., Toronto.

Mr. W. J. Dempster, Assistant Engineer, W. A. Murray Co., Toronto.

Mr. W. J. McCallim, Chief Draughtsman, Chapman Double Ball Bearing Co., Toronto.

Mr. J. E. Layfield, Assistant Superintendent, Canada Foundry Co., Limited, Toronto.

Mr. J. Craig, General Superintendent, Canada Foundry Co., Limited, Toronto.

Mr. L. M. McLean, Foreman Patternmaker, Canada Foundry Co., Limited, Toronto.

## MEMBERS PRESENT.

A. J. Lewkowiez.	S. Woods.	L. Salter.
J. F. Campbell.	J. Hooke.	E. A. Wilkinson.
J. Duguid.	J. Herriot.	W. H. Bowie.
H. H. Wilson.	J. Bisset.	F. W. Brent.
J. W. Shaw.	J. Irving.	G. D. Bly.
G. Till.	W. J. McCallim.	W. Jones.
R. H. Brown.	J. Meredith.	J. Fellows.
G. S. Brown.	C. G. Herring.	J. Wright.
A. M. Wickens.	H. D. Richardson.	C. Shand.
J. H. Shales.	E. Logan.	G. Baldwin.
W. Commins.	D. C. Hallowell.	H. G. Fletcher.
R. Pearson.	J. Dewsbury.	L. Westwood.
J. W. McLintock.	A. W. Carmichael.	H. Cross.
A. Stewart.	W. J. Bird.	H. Ellis.
J. McWater.	G. Bernard.	E. Blackstone.
B. Clarke.	H. E. Rowell.	W. E. Archer.
A. E. Till.	A. D. Porter.	J. Kyle.
E. B. Allen.	H. Eddrupp.	G. Black.
J. Dodds.	L. S. Hyde.	C. L. Worth.

Secretary,—

Last month I had the pleasure of announcing twenty-five new members, and this month regret this has fallen off to eight. I have said this before, yet it stands repeating; there are dozens and dozens of members in this Club who have not brought in a new member, and you all will agree with me, I am sure, that there is no reason why every member cannot bring in at least one new member.

Chairman,—

Has any member any new business to bring up?

Secretary,—

Before we pass over this item I would like to say a word about giving papers. There is a lot of knowledge and intel-

ligence lying dormant among our members and I am sure that there are quite a number who could give us very interesting papers. Supposing the paper is not a success from the member's standpoint, it will be so, however, from the Club's point of view. It can be discussed and the writer will find out a number of things which will be useful to him in these discussions. This Club is really a family gathering and not a criticizing body; therefore we would like to hear from all, either by paper or in the discussions.

Mr. Baldwin,—

I am sure that we all agree with what our Secretary has said, and I think it is up to us to try and get more new members and papers. However, I think if Mr. Worth would put a smile on his face when addressing us, his remarks would have more effect. I think now that a committee has been appointed to aid in securing papers, that our Secretary will have no further trouble in this regard.

With further reference to the social evening that we propose to have; I may say gentlemen, that we discussed this matter from all points and it was decided that in order to carry out the bylaws, so far as the social end of it was concerned, of the Club we should have a social gathering in the winter as well as in the summer, and it was decided to recommend at the next regular meeting to hold a social evening sometime in November.

Mr. Lewkowiez,—

In regard to assisting our Secretary in getting papers. I would like to say that there was a thing brought up last year which I thought was a good idea, that was the matter of the question box. I remember we had a very interesting paper and discussion on brake shoes and the matter of establishing a question box was brought up. I know of a number of organizations of this character where the question box is a very important one. It does not take precedence over the papers, but as many questions as time will allow are disposed of in an evening; and I may add that it brings out some very useful information.

Chairman,—

So far as I am aware we have never been stuck for a paper. The question box, no doubt, is a good thing, but the one doubtful thing about it is that it does not get us a paper for our journal. Of course you can arrange these questions so that the questions and answers would be in pretty good shape, yet I am afraid they would not be as good as a paper. Has any person any suggestions to offer?

Chairman,—

We now come to the reading of papers and discussions thereof. Gentlemen, it is with a great deal of pleasure that I call upon Mr. Shales, who has so kindly come here to-night, after working hard all day. He tells me he has been on the go from 7.30 this morning until now, and I think it is a very unselfish and kind thing for a man who has so many different things to do during the day, to prepare a paper as Mr. Shales has done, and as I said before, it is with a great deal of pleasure that I call upon Mr. Shales to read his paper.

### CARE AND MAINTENANCE OF ELEVATORS.

BY MR. J. H. SHALES, CONSULTING ENGINEER, ELEVATOR SPECIALTY CO., TORONTO.

There are several designs of elevators but only three types operated by either steam, water or electricity, steam being the earliest power used in the lift as it is called in the old lands. The first used for passenger service was at the Crystal Palace in London, about 1851, it being a very crude affair with chairs instead of wire cable from drum to car. The first hydraulic machines used in America were invented by the late Charles Otis about thirty-five years ago from which we have the different designs now in use and of which the plunger is the best.

By way of explanation, a plunger elevator is a new thing for the skyscraper. Yet it is the oldest kind of elevator in the world, but very few engineers ever thought it would be introduced into the twenty-story office building. After having been proved a great success in other cities it is coming to New York very fast. The method of boring the shaft is one of the marvels of the modern engineering age.

A shaft is started by setting up a short section of compressed steel piping. This is notched on one end like a saw blade. It is attached to an electric motor and set revolving. As it cuts down into the earth steel shot are poured down and allowed to settle around the saw teeth on the end of the steel piping. A stream of water is then forced down to assist the grinding and gradually the revolving pipe with its sawlike teeth, assisted by the steel shot, bore deep into the earth. The hardest stone can be penetrated. In fact, any hard substance can be cut through with apparent ease. When the first section of piping has been sent down another is screwed on and so the circular shaft is sunk. The core, whatever it may be, stone, clay, sand or water, comes up through the piping or caisson and is carried away.

It was while sinking one of these shafts the Otis Elevator Company encountered, at 47 Maiden Lane, where the S. F. Myers building is in course of construction, a very thick layer of hard granite. When the core was finally pulled out of the caisson it was found to be 16 feet long. This is the longest solid rock core ever taken out in Manhattan, and it goes to show that the thickest layer of rock forming the foundation of Manhattan Island is in the downtown district.

The Standard Elevator Company have eleven plunger elevators in the Trinity Building. These are the longest plunger elevators in the world. Eleven shafts, each 285 feet, have been sent down below the graves in Trinity churchyard. They are used to support the cars of elevators which supply the big office building, and if they prove successful the superiority of the plunger elevator over the cable elevator will probably be established not only to the satisfaction of the engineers, but to the capitalists who furnish the money to build the modern skyscraper.

There are two designs of elevators that cannot be overlooked; first, the Sprague screw machine, which is in common use, and second, the Duplex or Fraser Differential elevator.

The former, you have, I take it for granted, all seen. It is much like the horizontal hydraulic machine in operation, having no drum. The motor revolves on a long screw on which travels a ball nut and this nut moves the travelling sheaves. The operation of this elevator is very smooth, but the cost of repairs has to a large extent prevented its success.

The Duplex machine, on the other hand, might be said to be in its infancy, as only a few of them have been installed so far. It consists essentially of two motors mounted one above the other, each having a driving pulley or sheave on the end of its shaft, around which the driving ropes run. The car is suspended from cables, which, after passing over the main overhead sheaves, are attached to the counter-weight. From the top of the counter-weight frame ropes are carried over another overhead sheave and down to counter-weight device on which is mounted the tension sheave. The driving ropes run from the upper driving sheave over a sheave attached to the bottom of the counter-weight, thence around the lower driving sheave and over tension sheave and back to upper driving sheave.

The driving ropes are continuous, and as long as the two motors run at the same speed the various sheaves revolve in their places and the car stands still. As soon as the relative speed of the motor changes, the counter-weight is raised or lowered and the car moves correspondingly. This kind of elevator can attain the high speeds of the hydraulic elevators as the motors are not stopped in stopping the car. The car

switch controls two rheostats, one in the field of each motor and the field of one is weakened, while the other is strengthened as the car switch moves away from the central position. In the central position of the switch both fields are alike and the motors run at the same speed. The ease and rapidity with which these elevators are started and stopped is wonderful. In this respect, they are superior even to hydraulic elevators. Of course, the continuous operation of the motors means a greater power consumption, but this is largely offset by absence of starting current and the time saved in handling passengers. You may notice that I have not mentioned either automatic residence elevators, or alternating current elevators, but the omission is intentional. The automatic, with pushbottom control, offers an interesting study, but is used of course, almost exclusively in private houses, and hence you would have no occasion to deal with it.

In regard to alternating current elevators, many of you doubtless think the least said the better. Well, you can't have all the features of control of the direct current machines without making some very complicated apparatus, and there are some inherent faults which have not yet been overcome.

In an office building which I visit there is an alternating current elevator, which manages to keep running and carry passengers, but the tenants all know when it starts. It emits first a low groan, which rises rapidly to a high pitched humming sound and maintains this until the car stops.

In this connection I recall an amusing incident which occurred some time ago. One of our salesmen persuaded a wealthy Montreal man, who lives outside the city, to have an automatic elevator put in his house. Alternating current only was available, and at first the gentleman demurred. The salesman concluded a long eulogy on the push-button controlled elevator, by saying that the machine had almost human intelligence and would do everything but talk.

Some time after the elevator was running, our representative received a letter asking him to send out and have the elevator made more noiseless or take it out. "You told me," said the irate millionaire, "when you sold this machine, that it would do anything but talk, and the d—m thing is learning to talk now."

Of the first importance in connection with elevators are the safety devices. On the high grade drum type machine, we have first, the main brake, which is raised by a solenoid and consequently acts not only when released from the car switch, but whenever current fails from any reason whatsoever. Second, we have the stop motion switch which is operated by a travelling nut on an extension of the drum shaft and stops the elevator at either limit of travel by means of a

switch which is practically a duplicate of the car switch. Third, the potential on the controller which opens and cuts off current if the line voltage drops or whenever the slack cable or limit switches open. It is also operated by the car switch as heretofore described and similarly by the stop motion switch. Fourth, the slack cable switch is usually located underneath the drum and is opened mechanically, whenever one of the cables become slack. This opens the potential switch circuit, stopping the machine. Fifth, limit switches in shafts are so placed as to be opened by the car when it exceeds its normal limit of travel. They open potential switch circuit as before described and act as a check on stop motion in case it gets out of adjustment. Sixth, safety switch in car which opens operating line, and hence potential switch, and shuts down elevator. This is for the benefit of the operator if car switch should stick.

Where emergency brake is used safety switch operates this. Seventh, an auxiliary emergency brake is used on large machines which acts when all circuits are opened from car switch, or main current fails. This gives increased mechanical braking at a time when dynamic braking action would fail. Eighth, car safety which is controlled by centrifugal governor and grips rails, stopping car at any predetermined speed.

The best form consists of a ball governor at top of shaft, which grips governor rope at excessive speed. Governor rope is attached to car by a spring plug which pulls out readily. A second rope is fastened to governor rope and then wound round the drum of safety plank. When governor rope is gripped, this rope unwinds safety drum and by means of right and left screws and toggle joints or wedges forces jaws of safety together until they cramp the rails hard enough to stop the car.

The governor sometimes operates a switch to stop the motor before grips go on. Ninth, an air cushion is sometimes used as a last resort, if everything else fails. Tenth, slow down switches in shaft are often used. They may automatically cut in an auxiliary shunt winding on the motor as the car nears the upper and lower landings, so that limits of travel are approached at slow speed.

Although so many safety devices are required, they are comparatively simple in themselves and positive in operation. The general cause of accidents is the abuse of or neglect to care for them. Of course, you all know that trouble and accidents have occurred on all makes, it may be worth while to discuss them briefly and the means of prevention.

In the first place there are a great many contacts about the controller of an electric elevator, and it is essential that they be kept clean and in proper adjustment. Contact pieces that have to carry heavy current should have ample bearing

surface and where such contacts are used to break currents, they should have auxiliary carbon contacts, between which the final break and consequent arc occur.

In the controller of which I have spoken, copper discs are used and set loosely on their spindles, so that they rotate during operation and constantly present new surfaces to the contact pieces. A judicious use of emery cloth will keep these in order for a long time. Knife contacts, however, are very bad. I remember, one time when I was called in to investigate an elevator accident. The controller was a cheap solenoid affair with a double lever arrangement. The car rope turned a shipper sheave, which moved a lever and threw in the main switch, which in turn connected the solenoid and started the motor, the solenoid gradually cutting out the resistance. The switch blades happened to get bent and passed their clips, making a poor contact. The arcing set up fused the blades solidly to their clips and the operator could not pull hard enough on shipper rope to release them.

The car came on down to the bottom, and as soon as the ropes slacked, the mechanical slack cable device was brought into play. This merely threw a clutch into gear with a pinion, meshing with a rack on the same old lever, and as the switch blades still refused to let go the gear was stripped of its teeth, the lever bent and the controller board smashed. The main line fuses blew out at this point and saved the rest of the wreck.

There were two bad features in that elevator; knife contacts and a mechanical slack cable device. The remedy prescribed was a new and better controller. Great care should be used to keep wires from becoming crossed or grounded, as almost any combination of circuits can be obtained by grounding wires, and it is impossible to foretell the result.

I know of one case where an armature grounded and a sudden flash occurred clear across the commutator. The startled attendant grabbed a fire bucket and threw its contents on the motor. It put out the fire, but it pretty effectually put the motor out of business and cost a new armature.

Another thing, if you disconnect the field terminals, be sure to get them back right. If you get the series field in opposition the motor will surely run away. Even a loose connection in the field circuits may cause trouble.

It is well to remember, too, that the car is over balanced for the sake of economy, and if you jack the brake off while making some repairs, and at the same time, have the main switch open, the car had better be at the top of the shaft; otherwise it will soon get there and it might not stop at the roof.

A great many accidents in which people have been hurt

have been due to the car over-running the lower limit and breaking the counter-weight ropes at the top of the shaft and dropping the weights on the people below, when they would not otherwise have been hurt. This is easily prevented by having the weights securely bolted together by through bolts.

Sometimes hoisting ropes break and the car safety fails to operate. This cannot occur with a good governor kept in proper condition. It would seem superfluous to say that all moving parts should be kept clean and well lubricated, and yet most of the wear and tear and a great deal of trouble is due to just this lack of attention. All the cables, but particularly the hoisting ropes, should be carefully inspected frequently, and if the wires of the latter show signs of cracking, the ropes should be discarded. If they show wear on one side, observe how they lead from drum to sheave, or in case of B. D. ropes, from drum to vibrator. See that the vibrator shaft is so clean and well lubricated that the vibrator follows easily and does not lag behind, pulling the ropes off to one side.

I will touch on just one more point. The electric elevator in small buildings offers marked economy over other forms. No steam plant has to be run for its benefit, and it uses power only when it is in operation and then proportionately to the load carried. With average load, it takes only the power required to overcome frictional and motor losses. In general, you might expect an automatic residence elevator to use about 1.6 k.w.h. per car mile, and a big passenger machine for a large office building about 3 k.w.h. per car mile.

The duplex machine has not been thoroughly tested, but while using about the same current in operation, undoubtedly averages somewhat more due to its constant running motors.

Chairman,—

Is there anyone who would like to ask Mr. Shales a question? Mr. Shales evidently knows the elevator business from A to Z and if any person has any elevator troubles or snags, now is the time to ask questions.

Mr. Wilson,—

In case the car goes to the top of the shaft and the lower counterweight rests on the bottom of the pit, making a slack cable and it jumps off the drum. The operator comes along and gets hold of the controlling board and starts up the motor. The slack cable winds around the drum shaft and consequently the car starts down, but the weight does not start up very fast. I would like to know how the engineer would proceed who is called upon to attend to this job.

Mr. Shales,—

The best way I know is to send for an elevator repair man. We have found that it is best to have the drum counterweight hung below the car counterweight. The way our friend has asked the question you would think it was the reverse. With the car weights hung below the drum counterweight you would have to draw both up. The car is balanced about 200 pounds heavy. The drum weight is held over the back of the drum in order to help the car lift its load. When the car is properly balanced it will take very little power. In balancing a car like that it is the rule to set it so that it will draw equal power either way with a man on it. I have seen cases where both weights have been at the bottom on account of the cables being wound one over the other.

Mr. Lewkowicz,—

One thing I would like to know about plunger elevators. Mr. Shales kindly told us that they had elevators in Trinity building running twenty stories. I am not clear on this point as to how they would do this.

Mr. Shales,—

In balancing the plunger elevator as you are well aware, whatever is in the water you do not count as weight, but as the plunger comes out foot by foot so the weight is counted. You will notice that all such elevators have four to six cables which are fastened to the head of the car and as the car comes up a foot the weight of the cables is added to the other side. It is so balanced that it has only to lift the load on the car.

Mr. Blackstone,—

Referring to the elevators in the Traders Bank building, is there not a follower on the plunger?

Mr. Shales,—

Not that I am aware of.

Mr. Blackstone,—

The follower went up half way and then stopped.

Mr. Shales,—

You probably have reference to the telescope plunger. They tried it but it did not work. A firm in Portland, Maine, tried it but it was not successful. I may say those elevators in the Traders Bank building have seven inch plungers. You can swing them so that they will strike the rails on either side without breaking them. That is the reason they use steel cables through it so that if they did break they would be protected.

Mr. Irving,—

What do you mean by counterweighting.

Mr. Shales,—

In answering that question would say that the counterweight is a constant weight. As the plunger rises up they come down on the reverse side to balance it.

Mr. Irving,—

What compensates for that?

Mr. Shales,—

The plunger coming out of the water.

Chairman,—

Do I understand that a foot of cable equals a foot of plunger?

Mr. Shales,—

Yes. In the Union Bank building at Winnipeg and in the Tower elevator at the City Hall, there is a chain under it. As the elevator comes down the chain unwinds. The whole of that chain is hanging on to the elevator. The main thing in elevator work is counterbalancing. In the Union Bank building at Winnipeg we had them on there for the same purpose, to compensate for the cables.

Mr. Bly,—

I have listened with a great deal of interest to the paper as it was read by Mr. Shales and followed it very closely. I think it is along the lines which a good many of us need some education. However, in following the paper it strikes me that he barely touched upon the electric elevator which is the one we have most to contend with. They perhaps do not carry the greatest loads, yet I believe they are the most used. It seems to me that the electric elevator is all switches according to the paper. Now supposing there is trouble with that elevator, how is the caretaker of the building to find the right switch. It seems to me that the electric hydraulic elevator will eventually supersede the hydraulic elevator for small and perhaps large office buildings. It is adapted to variable loads and only uses current when necessary. The electric elevator as we have it to-day, seems to me to be too complicated. The manufacturers of elevators should certainly try and improve upon it in this regard. There are hundreds of screws and little fuses which may be hidden in some dark corner and it takes sometimes several hours to discover the trouble, and even the man who is called in to make the repairs has difficulty in doing so. Perhaps Mr. Shales can give us a little information along this line.

Chairman,—

Before Mr. Shales answers that question, I would like to also ask, in buildings such as bank buildings which have been spoken of, is there a code of instructions for the men who are attending to the elevators. For instance you employ an elevator operator to run it up and down and take care of it. I have never noticed any printed instructions in any of the elevators and therefore ask whether there are any such directions. Then again are these operators properly instructed?

Mr. Shales,—

I may say that it is very difficult for me to answer Mr. Bly's question without having drawings. Those switches are very simple and do not require very much care. While I was General Superintendent for the Canadian Otis Elevator Co. I always made it a point to instruct the operator about all those things. He sometimes does not remember these instructions very long and my experience with the man running these cars is that they are too anxious to get away. There are some places where these operators are paid a living wage, but frequently they are underpaid and do not take an interest in the elevator. They depend upon the like of us who make a living by repairing elevators.

As regards instructions, the Otis Fensom people, while I was in their employ, always had instructions tacked up in the motor room for the operator's instruction. Now everywhere I go if a man asks me a question I am always willing to answer it or show him anything possible.

Mr. Bly,—

When I was with the W. A. Murray Co. I believe the Fensom people put in the elevator there. If I remember right it was only in operation about three years when it had to be taken out. During that time I sent for the repair man several times and he would come down and look the elevator over and would go back to the shop for something to fix it. So far as I could see they would bring no more back than they took away, unless they brought it in their heads. As I said we managed with that elevator for about three years and then it was finally taken out. Whether it was condemned by the Otis Fensom people or the W. A. Murray Co., I do not know, but it seems strange to me that an elevator which had only run that length of time should have to be taken out. During that time there was an accident due to it running up to the roof. One morning the floor manager came to me and said there is something wrong with the elevator and asked me to go up in it with him. Just as we came near the top the boy threw the switch out and it kept on going. When we got to the top floor the manager

was hanging on to the top of the cage with both hands. That same elevator wound a man up and he died through the effects afterwards. In the Empire Building they had to build a new elevator because the old one was out of order so much. Now they only use it on occasions when the other elevator gets out of order. If the elevators are such a complicated affair, I think it is about time the manufacturers should try and perfect them. The trouble I find with the repair people is that you telephone for a man to come up and you are told all the men are out on jobs. You have to wait frequently three and four hours before you get a man and during that time of course the elevator is out of service.

Mr. Shales,—

With regard to Murray Company's elevator I do not think the Otis people were guilty of that machine. That elevator was installed by the company they are now amalgamated with. About the time I left them they had this elevator taken out and we put in two Otis elevators. It was my pleasure to inspect these machines this week and I may say that they are about as fine elevators as I have seen. We do not do the work there, but I do not think they have much trouble now in having repair men.

I must admit that it is somewhat difficult to keep elevators in repair but for conveying passengers I think there is less repairs done to an elevator than anything else used for similar purposes. Then again there are less accidents with elevators. If there is one you always hear about it through the papers, and they are frequently exaggerated accounts. For instance. I heard that a person was hurt in the Board of Trade building, and I hurried down to find it was an exaggerated story and had to deny it the next day in the paper.

For the man running a repair shop it is a difficult matter for him to keep repair men always on hand. In our shop we try to keep our men working eight hours a day while other shops they do not always do this and the consequence is the men stay on a job as long as they can.

Mr. Bly,—

Regarding the elevators at Eaton's; lately they have taken out all the old elevators which were driven by steam pumps and are operating them by motors, that is motor pumps. As the pressure rises the motors cut out. They seem to be very simple in their operation.

Mr. Shales,—

That is one of the latest devices and is one to which I have given some little time and study. I have been in large buildings where they have pumps worked in just the same

way. In the Edlicot Square building in Buffalo they have a pumping capacity to run sixteen elevators and handling ten thousand people. I was in the first National Bank in Chicago five years ago this Christmas and saw a plant there where they were running under 700 pounds pressure. The engine room was about thirty feet high and the engineer's office was away up at the top. They were working the accumulators at 700 pounds pressure. A brother-in-law of mine in the States told me he saw one of those pipes burst and it cut the pipe off like a saw. They are discontinuing their use on account of this danger to loss of life. The Simpson plant was put in with the idea of running to 700 pounds pressure. The joints are very strong and I may say it is the finest plant in the country. It is fully as strong as that at the Traders Bank. The electric pumping plant is an ideal plant, but for small buildings the electric elevator is the best. When the Hydro Electric commence supplying current, elevators of this class will be used more, but it is a question whether it would be cheaper to have an electric elevator and buy fuel for heating, or use the hydraulic elevator and use the exhaust steam for heating the building. Some years ago I was asked to go into this question with regard to the Board of Trade building. It figured to about four mills per trip for the electric elevator and two mills for the hydraulic, and they finally came to the conclusion that it did not pay to use the electric elevators. I think Mr. White, of the Canada Life, also figured it out and found it did not pay. If you did not have to heat the building it would pay to use electricity but otherwise I do not think it would.

Mr. Wilson,—

The paper as I understand it is on the care and maintenance of elevators, while all that has been said is good information, still we are getting away from the subject, the praise Mr. Shales has given our elevator plant is worthy of some answer.

First, I will ask Mr. Shales to tell the firm what he has said here to-night about our elevator. I may say that the elevators have always received better care since they were handed over to the care of the engineer's department. We have to-day two elevators, and in a new location with a steel structure put up through the building for the purpose of carrying these elevators. As for space in the motor room, I was given considerable more than we had in the old installation. You can get to either side of the motor without having to climb over any part of the machines. The care of our elevators I believe is quite systematic. The controlling board is examined each morning for loose screws, broken springs and leads, then the commutator is cleaned off with gasoline, and the

guide rails of each car are painted with a mixture of graphite and cylinder oil. This car is then put into service at 8.30. The second car does not start until 10.30, and in the meantime the car and motor and a section of the grill is wiped and dusted; also the over heads of this car are cleaned and the bearings provided with grease. The car that starts at 8.30 one morning does not start until 10.30 next morning; by doing the work in this way the whole shaft and machinery of each elevator has been looked over in two mornings. We also paint all our cables with the mixture of cylinder oil and graphite, which is wiped off and painted on again about once a month.

It was the practice with the old installation that if anything went wrong with the running of the car, the commutator got sand papered, but in our new installation the commutators have not been sand papered yet, and they have been in use nearly three years. I want to say that it has been a long time since the outside repair men have been called to make repairs; if anything goes wrong, we get together down there and work out the trouble ourselves.

While I may have been mistaken in which weight was resting on the bottom of the pit, nevertheless it is possible to get the two weights and car all in different positions in the shaft, and that is really what happened to us one day. The operator ran the car up until the lower weight rested on the bottom of the pit and the slack cable jumped off the drum, then he put the down latch on the control board and wound the cable around the drum shaft—it took us nearly two hours to get this fixed and without blocking the car which was high up in the shaft, as it was our first experience with this particular trouble, I would like to hear how Mr. Shales would do it.

Mr. Shales,—

It is possible to do it with the drum counterweight against it. It is simple to manipulate the car back and forth. The quickest way is to hang the car up and put on the safeties.

I may say that cheese cloth is much better than waste for cleaning. Also be sure and keep sand paper off the commutator. Let it burnish, but this will not hurt it. Cheese cloth is better than waste especially if you attempt to clean while running as there is a liability of getting some of the waste in the brushes and causing a spark.

Mr. Wilson,—

Our commutators are cleaned when the main switch is out. To get at the under side we lift the brake shoes by hand and turn the armature a half-turn.

Chairman,—

I heard someone say a while ago about the low wages paid to the man who is supposed to take care of the elevator. What I want to get at is, our mothers, wives, sisters, etc., are continually going up and down in these buildings, therefore we are deeply interested in their safety. Now I want to know who is responsible for these elevators. For instance, Mr. Wilson takes the utmost care of the elevators for the firm he is working for, and the elevator people say they have put in the machine all right, and the young man who operates the elevator does his best. Who is really responsible for that elevator in case of accident?

Mr. Shales,—

The elevators are supposed to be inspected every three months by the City Inspector, also by the Insurance people, who is your humble servant. Twelve months ago there was no city elevator inspector.

Chairman,—

In the small places where they have a boy to run the elevator there is the greatest risk then. I do not think there are many accidents on elevators, but it seems to me that it is a serious proposition.

Mr. Shales,—

Both Eaton's and Simpson's have a monthly inspection, by some competent man, but the small building is where the danger lies in all cases.

Mr. Brent,—

I am glad you touched on that point. I asked an elevator operator one day what that slack rope was for, and he said it was for safety. A short time after that the cable gave way and that slack rope was just as defective as the cable. The car came down killing twenty people. What I was going to ask, does every firm that has its own plant, have a governor on the elevator or is it compelled by the government to put one on.

Mr. Shales,—

Each firm has a governor of its own but they all are about the same type.

Mr. Lewkowiez,—

Going back to the matter of electric motor pumps and the matter of economy between steam and electricity, is there not a possibility of combining the two plants to run the elevators. For instance use electricity in the summer and steam

in the winter, thereby saving fuel in the summer and using the exhaust steam in the winter for heating purposes. Of course the installation of such a plant would be so high that it would be prohibitive.

Mr. Shales,—

The cost of installation would be so great that it would be condemned. The question of dollars and cents is of all importance.

Mr. Wickens,—

I have had a few elevator bumps in my life. I think when I first came to Toronto Mr. Shales put up four electric elevators which I had to operate afterwards. They were the first of the kind in Canada. We bought what we thought was the best elevator in the world, but I do not now advocate electric elevators and do not consider them equal to hydraulic. I am sure that Mr. Shales' paper has been very useful to us to-night, but his paper only reaches elevators in cities and in the class of buildings found in cities. There are the freight elevators, and bum elevators, these hurt more people than any other kind although they are supposed to only carry freight. I know this because I am connected with an insurance company where we carry accident policies on six or seven hundred elevators. The machines in our large office buildings are usually well handled and those in factories are fairly well looked after, but the machines I find trouble with are those in factories and warehouses that everybody gets on to and pulls the rope or one that any person runs. The matter of elevator inspection is right. The insurance man who inspects an elevator may make his recommendations, but he does not know whether they are carried out or not. There is no other business we come in contact with in the Dominion of Canada that needs thorough inspection more than the ordinary elevators and I think this Club would be right in passing a resolution and forwarding it to the Government that all freight elevators as well as passenger elevators should be inspected by proper officials. While there is a great deal about elevators which I would like to say, yet as the time is getting on I will not attempt it to-night. I wish to move a vote of thanks to Mr. Shales for the very able paper he has given us to-night.

Mr. Bly,—

I take great pleasure in seconding that motion. I think Mr. Shales desires the co-operation of this Club. I have been present at two elevator accidents. At the Simpson knitting mills I suppose we had more trouble than any other place. We invariably would get the elevator hung up by a truck or

rolls of goods between the floors and the elevator, then somebody would come and kick the truck out and down it would come. One day a boy came rushing to me and said that some one was in the hoist. I saw the cables going down slack, looked down and saw a man hanging up by the head.

Speaking of the elevators at W. A. Murray's, when you put two elevators on to take the place of one they should do a great deal better work.

I think Mr. Shales has given us a great deal of information and the discussion has been interesting.

Mr. Wilson,—

When I made those remarks I did not wish to convey the slightest insinuation. Our elevators to-day make as many trips as any others in the city because we carry cash boys who ring the bell the same as the advanced salemen. While you say they have not the load that other elevators have, yet they are started and stopped just as frequently and that wears the elevator out as much as anything. I may say, however, that we have as fine an elevator room as any in the city. We pay pretty strict attention to our work there, at least I have always got credit for it. Another very important thing about elevators is the adjustment of the limit stop on the drum shaft. While it may be nicely adjusted yet if it is not kept clean the current will carry over to the different dead bearing surfaces and the car will be carried higher than it should go, also the reversing latches should make and break at their respective contacts at the same instant, this will avoid excessive flashing and burning at the points of contact.

Mr. Duguid,—

What we have heard about elevators to-night has been good, but it has occurred to me that it is not so much the elevators that need attention but the people that run them. In nearly every business it is not so much the inspection of the machine as the proper education of the man handling it.

Mr. Bird,—

There is one elevator which Mr. Shales did not say anything about. It is the hydro air elevator. How does it compare in point of economy with the others?

Mr. Shales,—

You have reference to those installed at the Canada Foundry. They pump the air instead of the water. They are very useful providing your air pressure is constant. They are just as economical as the others.

Mr. Bly,—

Regarding those elevators in Eaton's; they say they cut the steam consumption in two. To my mind they would be well adapted for small office buildings.

Mr. Lewkowiez,—

There is one point which I would like to have made clear to me, it is regarding the matter of pneumatic hydraulic elevators. I understand they pump the water into the tank and in the other case you pump the air into the accumulator.

Mr. Shales,—

Then there is the open tank system, as in the Board of Trade and the Canada Life Buildings. The pressure is forty or fifty pounds. It simply gives you the pressure of the water. In the other case you speak of it is pumping the air in and using the water.

Chairman,—

If there is no further discussion I now take pleasure in conveying to Mr. Shales the hearty vote of thanks of the Club for his very fine and interesting paper which he has given us to-night. I may say for those who may not know, that Mr. Shales is a member of the Club. Coming down on the car I thought there would be very little discussion on this subject, but I am agreeably surprised, as I know you are, that it has been such a fine paper.

I also want to say for the benefit of new members, that if no person has spoken to you, I do not want you to feel that they are slighting you at all. We have a Reception Committee back there and it is their duty to take care of you. If they do not do it to-night they will, I am sure, do so some evening in November. I want you all to feel at home here.

Moved by Mr. Baldwin, seconded by Mr. Lewkowiez, that the meeting adjourn. Carried.