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OFFICIAL PROCEEDINGS

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

ROSSIN HOUSE, TORONTO, Nov. 19th, 1907.

The Vice-President, Mr. McRae, occupied the chair.

Chairman,—

We will now call the meeting to order.

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

You have all been supplied with our monthly magazine containing the minutes of the previous meeting, and it will only be necessary to have a mover and seconder for this order of business to be disposed with.

Moved by Mr. Baldwin and seconded by Mr. Fletcher that minutes of previous meeting be taken as read.

The Chairman,—

The second order of business is the remarks from the chair. I do not know that there is anything very special that I have to say, except that our President is not able to be with us this evening owing to his absence from the city. At the last meeting of the Executive Committee there was a Reception Committee appointed and it was decided that the following gentlemen be appointed, their duties being, to see that all members became acquainted with each other and to see that members filled out attendance cards and that same are collected.

The Committee consists of Messrs. H. G. Fletcher, D. C. Hollowell, J. W. McLintock, J. Bannon, G. Baldwin and A. J. Lewkowiez.

Chairman,—

The third order of business is the announcement of new members and I will now call upon the Secretary to read same.

NEW MEMBERS.

Mr. H. D. Clark, rep. Harbison Walker Refractories Co., Pittsburg; headquarters, Buffalo.

M. J. O'Leary, special representative Canada Oil Co., Toronto.

W. J. Randall, Locomotive Engineer, Toronto.

H. Clifford, Asst. General Foreman, Canada Foundry Co., Toronto.

D. Campbell, Storekeeper, Gas Works, Toronto.

R. C. Fisher, General Manager, Rice Lewis & Son, Toronto.

A. M. Wickins, Chief Engineer Canadian Casualty & Boiler Insurance Co., Toronto.

A. Taylor, Machinist, Toronto.

LIST OF MEMBERS PRESENT.

M. Wright.	W. R. McRae.	J. W. McLintock.
J. Mooney.	T. W. Palos.	R. A. Miller.
M. W. Barker.	A. G. McLellan.	J. D. Scott.
S. W. Price.	J. W. Harkom.	N. Borthwick.
C. L. Webster.	A. M. Wickens.	J. Hay.
Acton Burrows	J. J. Fletcher.	G. D. Bly.
C. A. Jackson.	Geo. Cooper.	O. A. Cole.
J. S. Campbell.	M. J. Randall.	C. A. Jefferis.
A. J. Lewkowiez.	J. Duguid.	W. H. Chidley
J. Markey.	Chas. Gildart.	J. W. Griffin.

LIST OF MEMBERS PRESENT—*Continued.*

N. MacNicol.	D. C. Hollowell.	R. Patterson.
W. J. Jones.	J. R. Armer.	H. G. Fletcher.
Geo. Black.	T. J. Ward.	J. McWater.
C. M. Murray.	C. M. Hill.	H. W. Cook.
F. Wright.	R. N. Card.	J. C. Blanchflower.
R. W. Grace.	W. T. Watson.	H. Cowan.
S. L. Trusler.	W. J. McKee.	R. G. Gilbride.
W. H. Wensley.	Geo. Baldwin.	F. G. Morris.
S. W. Price.	W. Evans.	G. McIntosh.

Chairman,—

"Reports of Standing Committee." Nil.

"Unfinished business." Nil.

"New Business." Has any member any new business to bring before the meeting.

Mr. Acton Burrows,—

I think that as members of this Club, which is now only about a year old, we may congratulate ourselves on the success it has met with, the gratifying growth of its membership and the interesting meetings which have been held.

As a member of the Executive I have been in close touch with the work from the start, and I have no hesitation in saying that the club owes its success very largely to two men who have discharged their duties most efficiently.

I refer to the President, Mr. Kennedy, and the Secretary, Mr. Worth.

They are the right men in the right place, and we have been particularly fortunate in having them in office at the inception of the Club.

Mr. Kennedy's term of office as President is drawing near its close, and I hoped that we should have been able to get the benefit of his services for another year, but, as you are aware, he has been appointed to a higher position elsewhere, which will prevent him from taking an active part in the Club's work in the future, though I hope he will often find it possible to come to our meetings.

Everyone of us is delighted at Mr. Kennedy's promotion, but our pleasure is naturally tinged with regret that he is practically going from among us.

He took a very active part in the initial steps for the promotion of the Club; he has been most diligent in his work as President, and has displayed in that position the enthusiasm and strong common sense which are among his striking characteristics.

We all owe him a deep debt of gratitude and I think we should put this on record.

I therefore beg to move,—The members of the Club having learned of the appointment of their President, Mr. W. Kennedy, to the position of Superintendent of Motive Power of the Central Vermont Railway, while expressing their deep regret that this necessitates his removal from among them, desire to extend to him their heartiest congratulations on his well earned promotion, to thank him for his untiring efforts in the interests of the Club, and to express their heartiest good wishes for his future success, health and happiness.

Seconded by Mr. Jeffries.

Chairman,—

Mr. Burrows and gentlemen: I most heartily concur in the remarks which have been made and passed upon and I doubt whether there is any member of our Club, since its inception up to the present date, who could have looked after the details and affairs of a newly organized club better than our President, and I am sure the members present will concur in what has been said. I have much pleasure in saying that this motion has been passed unanimously. Applause.

The Chairman,—

The seventh eighth, and ninth order of business are nil.

The tenth order of business is:—Topical discussion of questions submitted by members. Under this heading I have to submit a question on "Gray iron brake shoes v. steel insert brake shoes." A copy of which I think all the members present have been supplied with. Now Gentlemen, this to me personally, is a very important question, and I will call on some of the gentlemen present to take part in the discussion. There are quite a number of members present whom I do not know and perhaps among those members are some who are quite as able to answer this question as those I am going to call upon and I will ask those who care to discuss this question to rise to their feet and take part in the discussion. It is up to every man to show his ignorance by asking questions and by that method we will all become enlightened. I trust we will have a good discussion and if any member states something that you do not think is right, get up and thrash it out on the floor of the house for the benefit of those at the meeting, not only on my question but the others.

Mr. A. W. Adams,—

Driver Brake Shoes can be classified under the following heads:—

1. Plain cast-iron shoes.
2. Cast-iron shoes with hard metal inserts and reinforced steel backs.
3. Cast-steel shoes.

There are at least three points which should be considered:—

Frictional effect or retarding power,

Durability and wearing qualities, and,
Effect of the shoe upon the tire.

1st. A plain cast-iron shoe is not desirable for Locomotive service as while it possesses the requisite friction, yet this is more than offset by its very short life, thus making its use too costly. This kind of a shoe is further objected to, because of its poor tire dressing effect. Another objection is that owing to its short life, there is a great expense involved in the constant changing of shoes.

2nd. A cast-iron shoe with hard metal inserts and reinforced steel back is recognized as the ideal shoe. It has been found that a shoe constructed in this manner gives 4 to 5 times greater life than the plain cast-iron shoe. The inserts are placed in the face and groove of the shoe and when inserts are made of carefully selected metal give the desired durability. Experience has shown that the inserts should be placed so as to give a shearing or tire dressing effect and with due regard paid to this, it has been found that the friction or retarding effect is all that is desired. Another advantage from a shoe with the inserts arranged in this manner is, that it will wear the wheel tread to the greatest extent where the tread is least worn by the rail and will dress down the flange and maintain it in proper proportion to the tread of the wheel, thus eliminating danger of derailment and wear of frogs and switches. Another feature which appeals to the motive power superintendent is, that a shoe constructed in this manner keeping as it does, the tires dressed down to a practically normal condition, reduces the necessity of the engine going into the shop thus increasing its earning capacity. Such a shoe would not be sufficient for the service it is called upon to perform unless it be equipped with what is known as the reinforced steel back. The object of this back is obvious, viz:—In case of fracture, the entire shoe is held together and can be continued in service until completely worn down to the back. The reinforced back being constructed of soft steel, no service (no matter how hard) has been found to break it. The steel back when applied to insert shoes permits the use of thicker inserts, thus increasing the life of the shoe. It has been found that the chilling of the shoes has not proven satisfactory and therefore can be safely dispensed with. The chill is never uniform and unless the entire back of the shoe is completely covered with a steel back, there is always the probability of the chilled ends breaking, with the danger of derailment then existing, besides which loss of service and the reduction in friction until the chilled part has been worn away must be considered. A writer on this subject has made this statement:

"With shoes of heavy chilled areas, where there is "very little grinding, the sliding action over the steel "tire is emphasized and friction is reduced. The hard "chilled or tough ductile surfaces polish over and slide "where the open or granular structure make more inti- "mate contact with the wheel face and hold better."

3rd. Cast-steel shoes. We quote from a paper on this class of shoes read at a meeting of the Master Car Builders' Association at Atlantic City last June, and the following extract will be of interest:—

"Under the third head, are cast-steel shoes, used "exclusively on Locomotive Driver wheels, where thin "shoes are necessary. In the case of insert shoes which "offer sharp projections or cutting edges to dig into the "tire, the friction is increased in proportion to the cutting "effect, whereas in shoes of a ductile metal, such as soft "steel, wrought or malleable iron. the projections on the "shoe face tend to flatten out, the shoe to polish, and a "sliding action to result against the steel tire, reducing "the friction. With such shoes, however, when the "temperature rises to a point at which the metal begins "to flow, it frequently happens that lumps form on the "face of the shoe which becomes highly heated and burn, "causing hard spots which cut into the tire. The cast- "steel shoes in use on locomotives are recessed over the "limit of rail wear and bear over the flange and on the "outer tread, performing in a similar manner to the "insert shoe, a wearing action on that portion of the wheel "not worn by the rail. The trouble, however, with steel "shoes is scoring principally on the outer tread by the "flowed metal from the shoe, or metal torn off the wheel "and welded to the face of the shoe. Furthermore, the "recessed portion of the steel shoe picks up flowed metal "which when the shoe is worn down to contact with the "wheel over the limits of rail wear, tend to increase the "grooving of the tire by the cutting action of the flowed "metal which is extremely hard."

No shoe, no matter how perfectly constructed, will give the required service, unless proper attention is paid to the hanging of the shoe and reversing them, where the head will permit, to overcome the taper wear thus obtaining maximum life; but shoes not reinforced cannot be reversed without subsequent breakage.

There are numerous types of brake shoes upon the market and new ideas are being constantly developed, but so far, it has been found that a shoe made to the following specification has given the best results as a whole. No determination can be reached regarding the efficiency of a shoe until

it has been thoroughly tested out, every detail recorded and the shoes kept in active service for several months and the following specification is suggested, having in mind the consolidation of the best features of those shoes which have been successfully tried out during the past few years. Such a specification would result in the construction of a shoe which would give the desired frictional effect or retarding power, maximum life, keeping the tires and flange dressed in proper proportion to the tread of the wheel and in addition increase the earning capacity of the locomotive as indicated in the foregoing.

SPECIFICATION.

The shoe should preferably be made of soft cast iron into which should be molded hard metal inserts in the face of the shoe with their bases adjacent to the outer surface of the shoe, their points or apexes being turned inward and approaching the flanged groove. Inserts must present inclined shearing edges on the face of the shoe and the operative sides set back at an acute angle to the wearing surface. The back should be made of soft steel. It is not necessary to employ a plate covering the entire back of the shoe, the same result being obtained at a much less cost by using one or more strips of soft steel 3-16 inch thick made in zig-zag form and extending from end to end of the shoe and provided with beveled edges over which, in pouring, the molten metal will flow flush with the back; the strips should be united at the point of the bolt hole, where such is desired, and afterwards bored through. This construction will prevent the breaking away of the cast metal through the straining of the bolt when in use.

The following table of tests of different makes of Driver Brake Shoes for different classes of service, will, no doubt, be of interest:—

Class	Make of Shoe	Loco.	No. of Shoes	Mileage	Average miles per shoe	Total tire rail wear	Average tire rail wearper shoe
Passenger	A	4	15	431,172	28,745	37–64	2–64
"	B	2	6	144,545	24,091	24–64	4–64
"	C	1	3	21,402	7,134	15–64	5–64
Suburban	A	6	30	301,884	10,063	27–64	1–64
"	B	4	14	90,200	6,443	84–64	6–64
Freight	A	3	17	275,313	16,194	30–64	2–64
"	B	1	4	46,662	11,665.5	20–64	5–64
Switch....	A	6	18	172,683	9,590	50–64	3–64
"	B	5	15	125,528	8,368	92–64	6–64

"A" A shoe made to the foregoing specification.
"B" A shoe that has been extensively used, and so far has been recognized as standard.
"C" A soft gray iron.

Mr. Robt. Patterson,—

I was going to wait a while. My reason for waiting is that we have quite a number of gentlemen with us to-night who have had a large experience with these brake shoes and are better acquainted with the troubles met with in their use. I think it would be better for other members of the club and myself that others should speak first. I refer particularly now to some of our road foremen on both railroads. I think it would be advisable to hear from them first as they are having a great deal to do with that subject at present and have for sometime, and they will no doubt give us a good deal more on the subject to talk upon; therefore, I would prefer to say what I have to give later on.

Mr. Mooney,—

Chairman and gentlemen: My experience with the brake shoes for the heavy power is that the cast iron shoe wears out too quickly and with very little wear it breaks. With regard to the shoes that are inserted with steel we find that if they are not properly fitted to the head we have just the same trouble, only they will break probably with the first application. However, if they are properly fitted, they will last a long time. I cannot agree with Mr. Adams that we get the results claimed for by his paper.

Chairman,—

What have you to say regarding extra wheel tread wear by the use of insert shoe as compared with grey iron shoe?

Mr. Mooney,—

We have not had them long enough to tell. We have not had sufficient of them to watch them closely.

Chairman,—

Are these inserts you are using hard steel or soft steel or iron?

Mr. Mooney,—

Hard steel insert, I understand.

Chairman,—

I should like to hear from Mr. Grace, whom I believe is present with us to-night.

Mr. Grace,—

As my experience has been so limited in this matter, I would much prefer not to say anything on the subject. I am sure there are other gentlemen present who could give us a lot of information of interest, therefore, I shall be a good listener.

Mr. MacNicol,—

Nothing but wooden brake shoes were in use previous to the year 1850, commencing with that year wrought iron strips were introduced in wooden shoes. The wooden shoe was not abandoned till 1860. The development of the brake shoe has been slow when compared with other parts of railway equipment, still it has received a great deal of study and investigations date as far back to 1830. In the year 1878 a cast iron brake shoe with wrought iron inserts was brought before the M. C. B. convention. Several very complete tests of brake shoes were made for M. C. B. in 1901, and the results seems to show that while the grey cast iron brake shoes gave always a good retarding power, its wear was very great and overheating caused it to crack and break. The steel back was designed to overcome the breaking and brake shoes with inserts to make it more durable. The steel back increases the life of the shoe at least 30% and no shoe should be considered of satisfactory design that will not give better than 50% wear before it is necessary to scrap it. Just recently I made a test between a medium hard cast iron shoe and one with a trytangular steel insert, the conditions of test were average. Pressure on shoe and surface exposed number of application and length of application. All were exactly alike. I found the cast iron shoe was reduced 3.5 lbs. to 1 of shoe with insert. So the value of material in this shoe with inserts can be 3.5 times greater and still show a saving because the necessity for renewals with use of inserts shoes will be 350% less than common cast iron shoes. In Locomotive Practice no complaint is made that shoe with steel inserts wear tire too quickly.

Mr. R. G. Gilbride,—

I have not had enough experience in brake shoes to say anything more to what Mr. MacNicol has said. I know that when I was at York we used to get the large engines from Sarnia Tunnel with the shoes so badly worn that we had to change the whole set and I used to think that the shoes were in bad shape leaving Sarnia Tunnel, but I now find that this is not the case. I have noticed these shoes with the steel backs would break on the first application. It seems to me that if they made a thicker cast iron shoe that they would be more preferable than the steel insert shoes.

Mr. Black,—

I think Mr. MacNicol covered all the ground with regard to the heavy power engines. I know a case where the steel insert shoes were applied to a switch engine, the tires of which were in bad condition and they made a material improvement in the tire dressing qualities of the shoes and added to the life of the shoes, a long way ahead of the cast iron shoes. I understand the tread wear is decreased and the running

increased by the steel insert shoe With the cast iron shoe as Mr. Adams said, the metal flows into the tread and cuts much deeper than with the steel insert shoe, but I have no data on this question, so cannot be positive.

In reference to the question of our Vice-President, Mr. McRae, on the manner of applying and releasing brakes, or of stopping trains or cars, I presume he wishes to know the general practice followed which gives the best results. Speaking of passenger trains and using the different brakes, viz., the high and low speed, I think the general practice is with the high speed, to make about a 10 pound application by making three reductions, viz., 5 pounds for the first and 2½ pounds each succeeding reduction and more if necessary to reduce the speed of the train sufficiently to allow of a second application being made, which would bring the train to a standstill with very little effort, always keeping in mind that the brakes must be released before the train is brought to a standstill to avoid the back lurch caused by the tilting of the trucks. The same argument holds good for the low speed brake, which in service is twenty per cent. less efficient when full set than the high speed brake.

Now speaking of the manner of handling brakes on street cars, I presume they do not use the automatic brake on street cars, but use the straight air appliance. I have noticed some of the motormen, when bringing the car to a stop, will use a very heavy application, and should a passenger be on his feet he will generally make a hasty movement toward the front door, this is why I am not in favor of heavy reductions or applications at any time except of course where there is danger. I certainly think, and experience has taught me that, a vehicle of whatever class you may mention should be brought to a standstill without the passengers being aware that a brake has been applied and this can only be accomplished by gradual applications and the release so graduated that no shock will be felt.

Chairman,—

What about the insert shoe for coach work?

Mr. Black,—

I understand the tread wear is decreased rather than increased by the steel insert shoe contrary to what Mr. Adams says in his paper that the iron flows into the part of the tread where the rail comes in contact, but I have not had experience on this question and cannot speak positively.

Chairman,—Shall be pleased to hear from Mr. Harkom.

Mr. Harkom,—

As I am the older, I think I should have the privilege of hearing Mr. Patterson first.

However, I have not had much practical experience for some years past on this subject, and am not prepared to say much about it, but it seems to me the matter so far has been confined to the consideration of the driving brake shoe on the locomotive. Now on a locomotive there are from four to eight driving brake shoes, and on a fifty car train, four hundred shoes on the car wheels. In my opinion these two classes of brake shoes should be regarded from a different standpoint I think the only shoe which should be used to-day on locomotive driving wheels is a shoe which has a steel casing, which will protect the braking portions from loss in case of breakage.

The manufacture of a shoe with a steel insert is somewhat difficult. Little variations may occur in the foundry in the flow of the metal around the steel insert, and the little corners, all make points where fractures are likely to occur. As I have said before, I think there should be a steel casing to prevent the broken portions breaking away. Of course if the shoes are not properly fitted against the head, they will prove unsatisfactory and often break, and it is a pretty hard matter on a dark or stormy night to see if a shoe fits right.

Removing the face of the driving brake shoe on the part where the rail wear occurs is a good practice.

It seems to me that if any inserted material is put in a locomotive driving brake shoe it should be soft. It is desirable to put an insert into a shoe of that description because you have work for that shoe to do, which the ordinary grey cast iron will not do.

It seems to me that the question of tire wear by brakes on the locomotive driving wheels should be looked at from one standpoint and tire wear on the wheel, which is running along and is only required to carry weight, should be looked at from another. There is no question about it, the insert shoe is more destructive to the wheel. Cast iron brake shoes will do their work very effectively, but will often break and become dangerous. If we could get a satisfactory insert in these it would prove useful where tire wear is not important.

Data should be collected which will show which class of brake shoe is the cheapest in the long run. We know for a great many years oak blocks were used as they were afraid the wheels would not be strong enough to stand the strain, but we have come to the cast iron brake shoes on stronger wheels. Of course shoes that last the longest are the best from the round-house point of view.

Now if anyone would tell us exactly what the difference in cost is, that is what it all has to come down to,—the cost of an insert shoe on a car wheel as compared with an ordinary cast iron one, and used under same conditions. When we

get this data we would arrive at something definite, and until we get that, we could not come to a proper conclusion.

Regarding street car wheels, in my opinion the relieved insert shoes would be an advantage as they are really driving wheels. I think, however, a casing should be made to carry the braking portion, and the wheels be very carefully selected, the treads being ground true and all roughness removed from flanges and outer edge of treads.

Chairman,—

I would like to ask Mr. Harkom in what class he would place the grey iron brake shoe having a reinforced back for ordinary car service.

Mr. Harkom,—

I think it is a very good shoe indeed, but as I have said before, until we get data on the cost, we cannot decide. For cast iron wheels in that service I do not think I would care much about insert shoes. There are features about the heating of the wheel that we would rather be without and there are also imperfections in the surface which are apt to show themselves, resulting in locking and skidding. All these points must be considered, and I do not think the matter should be decided until it is taken up by a committee, with proper material at their disposal, for a proper test, and data gathered whereby a satisfactory conclusion could be come to.

Mr. Duguid,—

In my position I do not know much about the wear of the brake shoes. The only thing that I am brought into contact within regard to this, is the wear on the tires. As Mr. Mooney explains we have not many steel insert shoes, and I know that the cast iron shoes do not wear the tire much. We have records of the thickness of the tire before engine is sent out of the shop and noted the difference on its arrival back again, and it is found the difference is not much, but in some cases we find it is worn away down. Perhaps that is due to a defective tire or perhaps the steel insert shoe that Mr. McNichol put on was the cause of this. I certainly think there is not much wear on the tire from brake shoes. We hear a great deal about the amount of wear of the tires by the brake shoes, but we do not see it at the shop as the present kind of shoes used do not wear the tires.

I think there is a great deal in the shoe being the proper radius to fit the wheel. Perhaps the tire is ½ inch when we put it on and about the time the shoe gets down to its proper surface it is worn out. I think if a brake shoe was made 3 inches thick and a proper radius to fit the tyre I do not see any reason why it should not last for a long time. No wonder the shoe breaks at the first application as they are often not a proper radius.

This is only a few things I have noticed as I am not brought into contact with the shoe question.

Mr. Patterson,—

In listening to the remarks of Mr. Harkom on this brake shoe question, I think he has struck the key note of the whole situation when he states the question of which brake shoes should be made is really a matter of cost to the company applying them.

I remember making a test a number of years ago (I refer particularly now to driver and tender brake shoes). The test was made between the Lappin and the ordinary grey iron brake shoes. The results as far as I remember, were that the Lappin brake shoe lasted considerably longer than the ordinary grey iron brake shoe, but that when it came to the question of comparative costs, the company were not warranted in adopting the patent brake shoe.

Other tests have been made at later periods and in fact we are now making a test of the Acme brake shoe on our road, but as the tests have not been completed yet, we have no data to give. While, perhaps, in earlier tests, the special brake shoe did not show up to advantage owing to the light power and slow speed which trains ran, at the present time with our high speed trains and heavy power, a new order of things has been brought about.

I do not think we have any shoe on the market that exceeds the ordinary grey iron shoe in braking power, but there are objections to this shoe on account of the comparative weakness of the body metal, causing rapid wear and consequeatly frequent renewals. Second, the structural weakness when in service when subjected to blows or high heating. There has been a great many different classes of brake shoes in service on different roads, but there does not appear to be any special standard adopted by any number of roads.

What we require in railway service is a brake shoe that will give a maximum service without injury to the wheel with high retarding power. It must withstand the heaviest loads of application and be capable of standing the increased rate of heating caused by the introduction of high speed brake with its increased pressure applied to the revolving wheels.

While there is no question about the high retarding power of the grey iron brake shoe, its cheapness and easy application to brake head, I am satisfied that a brake shoe with a steel insert properly fastened so as to not weaken the shoe (which is the case in a number of present designs) and with a steel back which should be properly fused on the cast iron so that it would not allow pieces to drop away from the steel back in case of breakage of the cast iron portion of shoe, would be the ideal design of shoe.

A shoe of this kind would have a long life, be effective for braking power; also wear all the other portions on the tire than the tread. We would have a brake shoe that would be, I am satisfied, universally used, but it would have to be manufactured at a reasonable price without extortion of royalty on the pattern if it is to compete with our present cheap and efficient grey iron brake shoe.

Mr. Markey,--

This subject of brake shoes is a very broad one, and is surrounded with so many conditions that it is really a subject which should be studied very carefully.

I have had some little experience with three types of brake shoes, viz., the common grey iron shoe, which is known in street car service and in railway service; then there is the solid shoe; also the composite shoe, which consists of steel or cast iron (chilled) inserts surrounded by cast iron and reinforced by steel backs.

We made a test some time ago of chilled cast iron inserts surrounded by common grey iron and reinforced steel back. This shoe was gotten up by the American Brake Shoe Co. and put on test with the common grey iron shoe, with the result its efficiency was 2½ to 1 over the latter. In passenger car service, where they have the cast iron wheels with steel tires, it was not as efficient, as the results shown on the locomotive; it being only as 1½ to 1 as against the grey iron shoe. I might say that the difference in cost at the time was as about 2½ to 1.

Mr. Harkom fully explained the difficulty of making the composite shoe in a unit. For instance if you take a grey iron shoe and support at both ends to test its strength; and then take the steel back shoe with the inserts and subject it to the same strain, it would break more easily than would the grey iron shoe, due to the fact that the metals in the same were not fused together. I do not know of any process which will help us to do this.

The same applies to the reinforced back. There is no added strength to the shoe whatever through the use of the steel back, its use being only to hold the fragments together after the shoe has become broken. We made a test of these shoes on a train running between Battle Creek and Chicago, and owing to the numerous stops and slow-ups that were necessary between these points the shoes necessarily heated up considerably beyond the normal conditions and the cracks which Mr. Harkom spoke of showed up very plainly. At the same time these cracks work through from the face of the shoe to the back, and as the steel back was only held to the shoe by three or four openings some of the broken parts all away from the back, and in one instance nearly derailed

a train. Until such time as they are able to unite the different parts of the shoe, or fusing the back on, they will not be able to get the highest efficiency out of the composite shoes as was intended.

In passenger car service, which I spoke of, which as you know is nearly similar to the street railway service, the efficiency is less owing to the small diameter of the wheels and the numerous applications of the brake, which in turn heated the shoe greatly and caused it to crack and fall apart. Another thing that I omitted to say in connection with the construction of these shoes was the well known fact that when hot the cast iron comes in contact there is an excessive shrinkage which in turn starts a small incipient fracture, particularly at the corners. When these shoes are heated to any extent these fractures become more pronounced and ultimately work their way through the whole structure; that, in my opinion, is the trouble with the composite shoe of to-day. If it were possible to keep these composite shoes intact without cracking there is no doubt but that the life of these shoes would be four to one as compared with the grey iron shoes.

In switching service the brake shoes are hot nearly all the time owing to the frequent application of the brake, and, of course, this is hard on the tires. The amount of tire wear to-day, however, is not taken into consideration, owing to the fact that there is not the trouble experienced in turning up the tires as formerly was the case, as we have now the high speed steel which permits of this work being done easily, where as in the earlier days this was a matter for more serious consideration.

Now, referring to the statement made relative to the wear on the tires: the application of the brake shoe on the tires is not a factor to be considered as far as the wear on the tires is concerned, as the wear is simply proportionate to the weight of the engine and the work it has to perform. This wear is still further increased by the frequent use of sand on the rails when starting a train and the slipping of the engine. Besides the brake shoe of to-day only comes in contact with the tire and that portion of the wheel that extends beyond the rail, and as stated before, we would much prefer a brake shoe that would really keep up with the wear on the tire, or in other words, wear down that portion of the wheel that is not in contact with the rail as fast as the portion that is.

When I came here to-night I did not know what the subject was that was to be discussed, and, unfortunately, did not prepare myself with any data, but wish to thank you gentlemen for the time you have given me.

Mr. McLellan,—

About a year ago I conducted some experiments with Mr.

Adams. We received a set of shoes here and applied them to one of our large switching engines, an engine which wore out a set of brake shoes in three days. We applied these shoes to the tires of this engine, which had been in service for two months previous, and had ⅛ inch groove in the tire. We made gauges of the tire, and kept these shoes on for six weeks, and at the end of that time took them off, and the tire was found to be worn 1-64 inch and the brake shoes had hardly worn at all. The driver claimed that the grey iron shoe had the best breaking power, and was not in it with the steel shoes.

From a round-house point of view the steel casings on the shoes were just about right, we thought.

Mr. C. A. Jefferies,—

I have been away from railroad service some time now, but about seventeen years ago when I was Erecting Foreman for Mr. Meehan, Superintendent of Motive Power, of the Alabama & Great Southern Railway, I remember his remarks when we received a set of these insert shoes, "Now young man there will be no more tire turning, these tires are going down with the brake shoes." We equipped several of our passenger engines with these insert shoes and they wore about two and a half to three times longer than the ordinary shoe. Perhaps if you wrote to the President of either the Union Pacific or the Southern Pacific Railway, which roads I believe have made some extensive tests on shoes, and they would perhaps give us some valuable information. However, the whole thing hinges on the cost. I think the insert will last two or three times as long as the grey iron—but they will not last forever, and of course nothing will do away with tire turning. I do not know anything about the car service, but I think the insert shoes are certainly better for engine driver brake service as was shown on the System I was with. If anybody has been in that country and have been over the mountain Divisions they will know what they have to contend with.

Chairman,—

We shall be glad to hear from Mr. Wright.

Mr. Wright,—

I have had no experience with the steel insert shoe. I have always used the cast iron shoe.

Mr. Cowan,—

I have not much to say, but my experience has been in favor of the grey iron shoe. I am in the trolley service and we use the grey iron shoe mostly. In the old days we used the chilled Lappin shoe and got very good results out of it. We have had as high as thirteen months out of one set of shoes, but that was in the days of lighter cars and slower ser-

vice. Any shoe with a chilled surface will cut the head. There are some of the insert shoes that give very good results, one I might mention is the Allen & Morrison, This shoe has an insert of asphalt and steel turnings, but great care has to be exercised in the manufacture of this shoe, if not, the wall between the insert and the flange has to be put in a damp mould, and will cut the car wheel. This was our experience. I favor the grey iron shoe for the reason that in quick rapid transit and heavy cars in order to make quick stops you have to have a shoe that will grip the wheel.

Mr. J. W. Harkom,—

A remark has been made to-night as to why the shoes on locomotive driving wheels are not made thicker. Our friend, Mr. Markey, might tell us why this is so. It is certain we do not wish to have much heat developed between the shoe and the tire. The ordinary shoe is about 2 or 2½ inches thick, and there is no reason why it should not be made 1 inch thicker. In case of an insert shoe there would be that much more metal at the back to carry the insert and hold it in its place and to absorb heat.

Mr. J. Markey,—

One reason for the adoption of the present thickness on the present locomotive brake shoe in railroad practice, is the limit of travel on your brake gear. The travel of the piston on the locomotive brake cylinder is from zero to 4½ inches, and the brake shoe must be in proportion to that.

Mr. C. A. Jefferis,—

I think the great trouble is that there is not space enough to get in a much thicker brake shoe unless there was more distance between the wheel centres. At present there is not very much to spare on a great many engines. I do not think you can increase the brake shoe very much with the average engine, especially the American brake type which comes between the drivers.

Mr. Harkom,—

That does not exactly answer the question as I intended to put it. It is not a question of wearing the shoe any more. I would not allow the shoe to wear any further than before, but would make it set farther into the socket. The head might be made a little different shape; that is to say that the fulcrum distance from the fit of the shoe and head could be modified and in that way get a little more thickness on the shoe. I would try to make the socket fit so that there will be evidence when the shoe is worn down, that it is time to change it. Of course I have seen them without a shoe at all. I remember once seeing a brake beam doing the work.

Mr. McIntosh,—

The remarks made this evening ia regard to the matter of brake shoes have been very interesting and no doubt beneficial to those interested in railways, whether it be electric or steam, and I cannot say there are any new points which I can introduce for discussion.

The Grand Trunk Railway Co. have on different occasions tested various kinds of brake shoes on their engines in order to improve conditions, but advantages gained by introducing brake shoes of hard metal have always been gained at the expense of the brake by increasing the distance in which the stop was made. The advantages gained by the use of hard shoes are certainly worthy of consideration, but are not the advantages lost by the use of these hard shoes, also worthy of deep consideration. There is no doubt about the decrease in expense, both in brake shoe wear and tire turning by the use of the hard shoe, and there is also no doubt of the extra distance it requires for to make the stop in by using these hard shoes, and sometimes the short distance stop will more than repay the extra brake shoe and tire expense and possibly be the means of preventing loss of life. Engineers object to the solid steel shoe on account of the flange which forms on either side of it, hugging the wheel when the brakes are released, causing breakage to bolts and loss of shoes; also extra strain on brake rigging and extra heating of tires. The common gray iron brake shoe causes considerable expense by repeated renewals, but it gives the desired results in regard to stopping the train, and while shoes of a harder nature have the advantage of reducing the tire groove. Still this advantage should not be given preference to distance when the real point of view is stopping that which is in motion.

Chairman,—

No doubt we have all benefited by the discussion which has taken place to-night and I trust that we will have many more evenings devoted to the "Question Box," as the time of adjournment is near at hand I might say that we have one more duty to perform to-night, that is, the appointment of a nominating Committee of five, according to Section 10, of the By-laws, who shall present at the next annual meeting nominees for each office to be filled. I therefore declare the meeting open to receive nominees.

Nomination have taken place the following gentlemen were nominated:—

Messrs. G. Baldwin, J. W. McLintock, E. D. Bly, A. G McLellan, J. J. Fletcher.

It was then moved by Mr. Acton Burrows and seconded by Mr. C. A. Jefferis that these gentlemen be elected.—Carried.

Chairman,—

At the last meeting of the Executive it was decided that the meetings would start at eight o'clock sharp. I know that it is hard to get here at that time, but if possible do so as we wish to close at ten o'clock or as near as possible.

As this concludes the business for the evening I would call upon some gentleman to move an adjournment.

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