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. THE CENTRAL . .
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OF CANADA

OFFICIAL PROCEEDINGS

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C. L. WORTH, Sec.-Treas., Room 409 Union Station, Toronto.

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

ROOM 315, UNION STATION, TORONTO, May 18, 1909.

The President, Mr. Jefferis, occupied the chair.

Chairman,—

We will now come to order.

It is in order for some one to move the adoption of the minutes of the previous meeting as read.

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

Chairman,—

I will now ask Mr. Fletcher, Chairman of the Reception Committee, to advise us what has been done in connection with the outing to Jackson's Point.

Mr. Fletcher,—

So far, I have not been able to accomplish a great deal, but I was in communication with Mr. McDonald, who entertained us so nicely at Jackson's Point last year. While he has not yet opened the hotel, he is very willing and a xious for us to go there. I propose to go there in the course of a week or ten days to arrange everything definitely.

As far as the entertainment is concerned it is almost a little too early to say anything definite about that. We have not had a meeting of the committee to decide on the prizes for the Marathon, 100 yards dash, etc., but we will have everything ready by the 19th.

Chairman,—

In addition to the remarks made by Mr. Fletcher, I may say that, Mr. McRae has very kindly arranged matters with the Railway Company so that we can get one or two cars. Last year there were many members who thought they would not have very much of a time and did not go, but they were very sorry members afterwards, and they will surely want to go this year. The date has been set for June 19th, to Jackson's Point. That is on a Saturday so that everybody can, if nothing comes up to prevent it, make arrangements for that date. In the course of a week or two any members who have friends

they want to sell tickets to, if they will call up Mr. Worth, he will let them have the tickets. The cost will be very reasonable, one dollar, which includes dinner and a 114 mile ride. This is a bargain picnic. In connection with the picnic I would like to read this letter from Mr. C. L. Wilson, Asst. Manager of the railway company:

"With reference to your enquiry *re* rates for the annual excursion of the Central Railway and Engineering Club to Jackson's Point, to be held Saturday, June 19th.

"I beg to quote you $60.00 a car, that being our regular price from Toronto to Jackson's Point, and I will be pleased to donate $20.00 a car as a member of the association, so that the price will stand to the Club $40.00 a car.

"I would be pleased to hear further from you as to details of time of leaving, etc."

Mr. Worth says we ought to leave at 8.00 o'clock. How about the men coming in on trains, we must give them consideration; however, I think 9.00 o'clock gives everybody time to get down.

I may say for the benefit of the members, that we selected Saturday, because we know the majority of the shops and factories close down on Saturday afternoon, and as some of you have a hard time to get off, it was decided that Saturday was the best day, and you will have time to rest on Sunday. You had better get into training at once, as I know some of the members over thirty years of age have already commenced training for the Marathon.

I would like to call on the members to come forward and give papers. It is a very easy thing to say to you, "Give us a paper for the month of November or December," and ask for the title of the paper, but it means a lot of hard work and time, especially to the busy man who has to do the work at night. It is easy for a representative of a firm to come here and give us a paper, as he has the whole matter in hand.

For example, here is a gentleman who came down from Stratford. It means a good deal for a man to come down here and give us a paper simply because he is a member of the Club, and if there is any other member who will kindly give us a paper I shall be glad if he will advise Mr. Worth.

There is just one more thing I would like to call your attention to, and that is paying your dues. Some of us have forgotten this little matter, and as we get so much out of the Club for $2.00—the papers and little sociabilities, etc.—I think it is about the cheapest proposition I know of, and I am sure if any of you have forgotten to pay your dues you will pay them to-night.

I will now ask the Secretary to read the names of the new members.

NEW MEMBERS.

Mr. R. H. Brown, Brass Finisher, C.P.R., Toronto.
Mr. G. G. Till, Machinist, C.P.R., Toronto.
Mr. L. Westwood, Chief Engineer, J. F. Brown & Co., Toronto.
Mr. Jos. Cave, Chief Electrician, Canada Foundry Co., Toronto.
Mr. J. Walker, Inspector, Canada Foundry Co., Toronto.
Mr. D. Waters, Foreman, Canada Foundry Co., Toronto.
Mr. O. A. Burt, Fitter, Toronto.
Mr. C. L. Drury, H. A. Drury Steel Co., Toronto.
Mr. P. Brundrett, Foreman Millwright, Canada Foundry Co., Limited, Toronto.
Mr. Jas. L. Logan, General Storekeeper, Canada Foundry Co., Limited, Toronto.
Mr. Chas. H. Bull, Machinist, C.P.R., Toronto.
Mr. Mark A. Ross, Treasurer and General Manager, Pyle-National Electric Headlight Co., Chicago.

MEMBERS PRESENT.

A. E. Till.
J. H. Stortz.
R. Stockhill.
D. Ross.
J. McWater.
T. McLean.
I. Jefferis.
D. Hallowell.
J. Fellows.
W. S. Cowan.
W. E. Cave.
E. Blackstone.
O. A. Burt.
R. W. Brown.
W. R. McRae.
F. R. Wickson.
H. J. Westbrook.
C. H. Young.
J. Dodds.
L. S. Hyde.
C. Bull.
W. Sealey.
G. Shand.
H. E. Rowell.
P. McCabe.
E. Logan.
H. O. R. Horwood.
J. Herriot.
A. W. Durnan.
R. Carmichael.
W. J. Bird.
J. C. Blanchflower.
F. W. Brent.
Acton Burrows.
J. Duguid.
G. Verner.
N. D. Watmough.
H. O. Eddrup.
G. Black.
C. L. Worth.
G. Till.
H. Spencer.
J. L. Richardson.
R. Pearson.
N. MacNicol.
W. G. Larmour.
C. G. Herring.
C. Geldart.
G. Cook.
W. H. Bowie.
E. R. Battley.
G. Baldwin.
W. E. Archer.
H. G. Fletcher.
L. Westwood.
A. M. Wickens.
E. B. Allen.
J. Kyle.

Chairman,—

I would just like to say to Mr. Brown and Mr. Till, of the Canadian Pacific, on behalf of the Club, that we appreciate your membership very much. We have been very anxious to get some members from the C. P. Ry. I know it is a long way in from the Junction, but it is not as far as Stratford and

Mr. McRae has promised us a good service from the Junction. On behalf of the Club, I welcome you very heartily.

Mr. Baldwin,—

In reference to bringing in new members, I would just like to say a few words. I find it the easiest matter in the world to get new members for this Club, especially by just mentioning the picnic. I have two or three ways of getting members, one of them is this. I make out one of the application forms and show it to the party I would like to get in, and tell him that I have made out his application, and the next thing he knows is he gets a card from Mr. Worth, I pay the $2.00, and get it back from the new member, and I have never lost anything by it, and I would recommend other members to do likewise. Certainly I have got a very good field at the Canada Foundry, but still I think every member should bring in at least one or two new members during each year.

Chairman,—

We have with us to-night Mr. Geldart, Foreman of the G. T. Machine Shop at Stratford. Mr. Geldart has been for some years foreman of the Tool Department and every mechanic present knows what being foreman of the Tool Department means, it means the keynote to accuracy in the shop, it means the keynote to standardization, and I am sure there will be no one better able to tell us about these pneumatic tools than Mr. Geldart. The great point in the average machine shop is to have accurate tools, and any man who is familiar with machine shop practices, knows that one of the main stays in the shop is the man who has charge of the Tool Department, and I have a great deal of pleasure in welcoming Mr. Geldart down here to give us this paper. I will now call on Mr. Geldart.

PORTABLE PNEUMATIC TOOLS.

BY MR. C. GELDART, MACHINE SHOP FOREMAN, G.T. RY., STRATFORD.

When it was first proposed to me to read a paper before the Club on Pneumatic Tools, I scarcely thought it would be interesting enough to members of the Club, but after due consideration, and the fact that Pneumatic Tools are of such importance in our daily work, I decided if I could make it plain to members how and why these tools work, it would be interesting and furthermore well worthy of attention and study of all mechanics. If I am successful in imparting this information, I shall feel amply repaid for any trouble I have taken.

I may say that to Mr. Patterson, Master Mechanic at Stratford, and Mr. Larmour, I am deeply indebted for the assistance they gave me in getting up this paper. Mr.

Patterson was very kind in placing at my disposal every means for getting up this paper, and Mr. Larmour has been very kind in getting up these fine drawings.

Portable Pneumatic tools comprise some of the most important time and labor saving devices that have been introduced into the different mechanical and engineering trades during the last twenty-five years, they are efficient and ingenious, showing the result of careful study and much experimenting, and are strictly of a high-class workmanship. The pneumatic tools on the market to-day are far superior to what they were a few years ago, both in durability, efficiency and simplicity. which means that the tools will give longer service and less cost for maintenance.

Their introduction into the structural steel and ship-building trades has been the means of making a great saving in labor and time, and it is safe to say that these trades have simply been revolutionized by the introduction of pneumatic tools and they have not yet reached their limit of usefulness.

One important factor is the minimum loss of power, also its flexibility. The air can be carried almost any distance with a small loss, which is caused by friction only. There is also the convenience in handling and cleanliness.

The railroad shop has undoubtedly brought forward many new uses for the pneumatic tool, not only using hammers and motors most extensively, but have introduced many other appliances such as staybolt breakers, staybolt nippers, pneumatic hoists, presses, tube welders, tube expanders, tube piecers, turntable motors, valve setting motors, jacks, drop pit jacks, test pumps, white-washing machines, portable forges, frame heaters, dolly bars, sand shakers and other tools, and their introduction has always resulted in cutting down the cost of production.

Pneumatic tools have superseded all hand work in boiler-making, such as rivetting, drilling, tapping, reaming, screwing in staybolts, cutting them off and rivetting same, chipping, caulking, expanding and beading tubes. The superiority of machine driven rivets over hand is too well known to question. The machine driven rivet fills the hole completely and forms a better and stronger head, besides drawing plates together more closely, and require less caulking to make the seams tight. Practical boilermakers know that when they are using the long stroke hammer for putting in rivets, that they always have to order their rivets slightly longer than if they were doing hand rivetting.

On the locomotive, we would be at a loss to know how to get along if we did not have these tools for drilling, tapping, reaming, chipping, driving portable cylinder boring machine, valve facing machine, valve setting machines, etc.

Of the numerous types of drills on the market that have come under my personal attention, drills of the reciprocating piston type have proved to give the best satisfaction.

They will maintain their power much longer, cost less for repairs and consume less air. Nearly all types of drills using oscillating or revolving cylinders have a tendency to wear cylinders and pistons quickly, cylinders usually wear larger at the mouth. This means leakage of air, destroys power of machine, besides consuming a greater quantity of air, and in fact becomes wasteful and inefficient. The rotary type drill consumes more air than either of the former types spoken of. Motor consumes from 20 to 40 cubic feet of free air per minute according to their size. See table.

Drilling capacity.	*Cub. ft. of free air per minute.*	*Gauge pressure.*	*Volume of free air for 1 cu. ft. at given pressure.*	*Volume at given pressure for 1 cu. ft. at free air.*
Up to ½″	15	50	4.401	.2272
		55	4.74	.2109
Up to ⅞″	20	60	5.08	.1967
		65	5.42	.1844
Up to 1¼″	25	70	5.76	.1735
		75	6.10	.1638
Up to 2½″	35	80	6.42	.1552
		85	6.78	.1474
Up to 3″	45	90	7.10	.1404
		95	7.46	.1340
		100	7.80	.1281

The pneumatic hammer has come more prominently into use in the last ten years, although I have heard of a hammer that patents were issued for in 1890, and I suppose each succeeding year since. In reading over the minutes of a meeting held in England some years ago, a member stated that he had invented a valveless hammer some fifty years ago, so you will see that this matter has been receiving the attention of engineers for a considerable period of time.

As pneumatic hammers fill such an important part in the every day work of most shops, I propose to try and make plain to members present, the principle upon which they work, also why they sometimes fail to do what is required of them. As far as I can learn, the valveless hammer, or hammer with differential area piston was the first one ever used, and is being made and is in service to-day. Hammers may be divided into two classes, the one using the valve, and the valveless.

The valveless hammer was the first hammer approaching success, and the valve hammer has been evolved from it. The

valveless hammer is simply a differential piston doing its own admission and release. They strike very rapid blows, from 1,000 to 2,000 per minute, but the blows are not powerful, and the hammers are used chiefly for light chipping and caulking of sheets and other similar work.

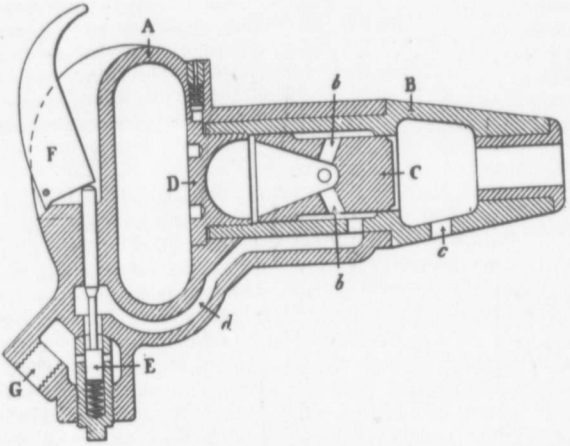

FIG. 1.—VALVELESS HAMMER.

A, represents a bronze handle, into which is fitted the steel liner B, which forms the working cylinder; C, the striking piston, which acts as its own valve; D, the outer cap, connecting the liner to the handle; E, the throttle valve; F, the trigger actuating same; and G, the point to which the air supply is attached. The action of the hammer on the trigger being depressed, is as follows:—The air having passed the valve E, flows along the passage *d*, and through a large air-port into the cylinder or pressure chamber; this has the effect of maintaining a constant pressure under the shoulder of the piston, and tends to drive it backwards. When, however, the ports *b* in the piston C, which are also large openings, come into communication with the cylinder, the pressure fills the hollow portion of the piston and the cylinder in its rear, driving the piston forward to strike its blow. At this instant, however, the piston ports come into communication with the exhaust port *c*, when the pressure under the piston shoulder again returns the piston and the blows are repeated in rapid succession—it is stated as many as 1,500 to 2,000 per minute. It will be noticed that in this arrangement of ports the air is used expansively. The same type of hammer is made in a

modified form, being provided with a second piston placed in the rear of the other, the actuating fluid working between the two pistons for the forward stroke. It is claimed for this that vibration is reduced to a minimum.

Coming now to the valve hammers, to describe them briefly, and at the same time accurately, is not an easy matter, because, although they are simple in action and not excessively complicated with regard to the number of working parts, yet their movements and arrangement of ports are such as to make their description somewhat difficult.

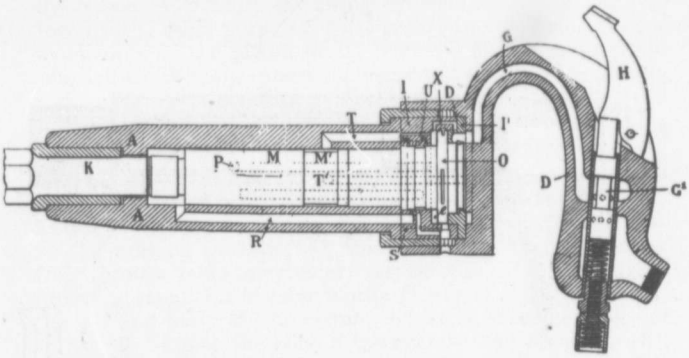

FIG. 2.—"BOYER" HAMMER.

I will endeavor to make plain as possible the valve hammer as shown in Fig. 2. The hammer has a valve for the admission and release of air. Fig. 3 is a section showing the hammer piston and valves in their rearward position; Fig. 4 is a section showing the hammer piston and valves in their forward position. The air line is connected at the point 1, and air is admitted in and around casing 2 and back of the ball 3, the ball is shown seated and is held in this position by the spring 4. By pulling the throttle lever 5, which is fulcrumed on the pin 6 toward the hammer, the ball 3 is unseated by means of the pin 7, which admits air to the passage A and A1 to the passages B in the valve block, and to the front groove in the block. When the hammer is in operation, these passages and the front groove are constantly full of air. Taking Fig. 3, the air enters at the rear of the piston as shown by arrows —driving piston forward—the air in front of the piston is exhausting through the ports Ax and through D back through the valve and out of Mx and to the atmosphere. When the piston arrives at the position shown in Fig. 4, it has delivered its blow—it is at this point when the valve is to be shifted

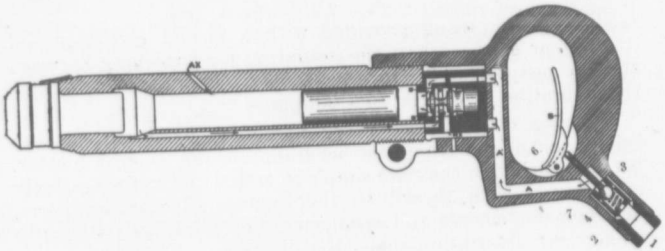

FIG. 3.

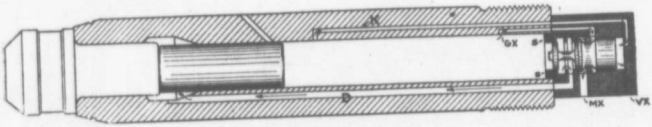

FIG. 4.

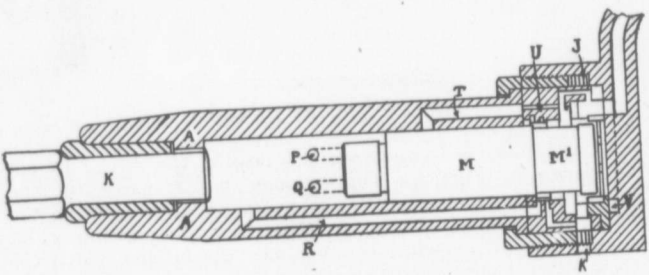

FIG. 5.

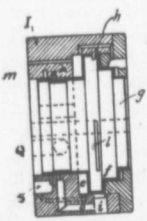

FIG. 6.

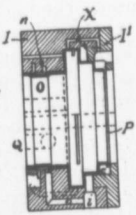

FIG. 7.

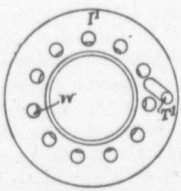

FIG. 8.

FIG. 9.

forward to return the piston. When the piston is in the position shown in Fig. 4—air travels through the passage K to the rear of valve—forcing it forward by reason of the greater area of the rear end of valve—see Fig. 4—this action connects the D passage with the front groove in valve block and supplies air to front end of piston driving same to the rear. The air is exhausting out from the rear of piston through the passages Gx through the valve and Mx to the atmosphere. When the piston on its rearward stroke passes the passage Gx there is a live air cushion formed between it and the valve block—by reason of exhaust Gx being closed and live air flowing through the small ports S.S front groove in valve block. The momentum of the piston on its rearward stroke coming into this live air cushion, causes the valve to be shifted rearwardly and to the position shown in Fig. 3, which completes the cycle of the movement. The port Vx is to prevent any air having a retarding influence on the valve on its rearward travel.

"BOYER" HAMMER.—Figs. 2, 5, 6, 7, 8, 9, show several sectional views of a "Boyer" hammer, in which the following letters of reference indicate the various parts referred to:—A, the working cylinder; D, the handle; G, the air passage from throttle valve to cylinder; G1, throttle valve; H, trigger actuating same; I, the valve block; I1, cap at end of same; K, the working tool; M, the piston, consisting of a solid piece of turned steel fitting the bore of the cylinder and provided with a recess M1; O, the valve; P, passage from cylinder to small space *e*; Q, passage from cylinder to small space *n*; R, passage from front end of cylinder to small space *m;* S, port leading from space *e* to front of cylinder through passage R; T, passage from cylinder through U to space *e*; T1, from air-supply to cylinder; X, from air-supply to *e*.

X is only necessary to supply fluid to front end of piston *via* S and R and to hold the valve in rear position. Other letters on the drawings are referred to in the following description of the working of the hammer:—Figs. 2 and 6 represent the piston in its forward, and the valve in its rearward position. The motive fluid having been admitted passes along the passage G and then through W into space *e*1 and acts on small area *d* of the valve O, and tends to force the valve forward, but fluid pressure in space *e* admitted by the passage X acting upon the large area *c* of the valve O will hold the valve in the rearward position against the pressure acting on the small area *d*. The fluid will pass from space *e* through passages S and R to the front end of the piston driving the latter backward, the rear end of the cylinder being open to exhaust through the slots *l* in valve O and groove *h*, the latter being constantly open to the atmosphere through passages *i*, *j*, *k*. As the piston moves backwards, it uncovers ports P and Q, and the pressure in front

end of cylinder will exhaust through passage Q *via* the groove *n* and passages *o*, *i*, *j*, *k*, to the atmosphere; the front end of the passage P will be uncovered by the front end of the piston at the same time as the front end of the passage Q and the fluid in space *e* will escape through passages P Q, groove *n*, and passages *o*, *i*, *j*, *k*, to the outer air. Passage P being larger than passage X by which the fluid is supplied to the space *e*, the pressure on the large area *c* of the valve O will be greatly diminished, so that the pressure acting on the small area *d* of the valve O will force the valve forward to the position of Figs. 5 and 7, whereupon the ring *b* of the valve O will close the passage X and cut off the supply of fluid to space *e*, thereby permitting pressure at *d* to hold the valve in the forward position. The annular space *p* will now be opened from which fluid pressure *via* W and *e*1 will pass to the interior of the valve, and acting on the rear end of the piston will first bring it to rest forming a cushion and later drive the piston forward. As the piston moves forward and finally strikes a blow on the chisel the air in front can escape through passage Q until the latter is closed by the front end of the piston and thereafter can escape through passage R, grooves *m*, *a* and *n*, and passages *o*, *i*, *j*, and *k*, to the atmosphere. When the piston is moved so that T and T1 are in communication *via* groove M1, fluid under pressure will pass *via* T1, M1, T and U to space *e*, and acting on the large area *c* of the valve O will overcome the constant pressure on its small area *d* and force the valve backward, and thus open X, admitting more fluid to space *e* to hold the valve in that position; also fluid will pass from *e* to R *via* S and to the front end of the piston to assist in driving the piston back. The recoil accomplishes most of the return of the piston. During the backward movement of the piston, the end of the cylinder is open to exhaust through slots *l* in the valve O and groove *h* and passages *i*, *j*, *k*, until the passages P and Q are uncovered by the front end of the piston, at which time the valve opens, and, admitting fluid, arrests the piston and drives it forward. Although communication between T and T1 is cut off almost directly the piston commences its backward movement, the valve O will not change its position (from rear to front) because sufficient fluid pressure is passing into space *e* through passage X to hold the valve notwithstanding the escape of the fluid *via* S, since the latter is of less capacity than X. It will be readily understood that the action of the compressed air along the passage G, acting first on one area and then on another area of the valve O, drives it in alternate directions, and that the valve in turn admits air to either end of the cylinder; at the same time the piston opens and closes certain ports in the cylinder as in the case of the valveless hammer, and the combination of the dual motions of the valve and the piston produces the desired result of causing the piston

to rapidly reciprocate and deliver a number of blows upon the tool K. In this hammer it will be noted that the striking piston passes through the valve, which has the effect of increasing the stroke of the piston as compared with the original design of the hammer (in which the valve was arranged in a separate chamber immediately in the rear of the piston chamber) and without increasing the overall length. In order to effect a cushion on the piston on the rearward stroke, live air is admitted before such stroke is completed. With regard to the valves, owing to their extreme lightness and shortness of stroke, it is stated that cushioning of the valve is unnecessary.

The power of a hammer is somewhat difficult to measure. Many machines have been devised to get this information, but nearly all have been abandoned. The foot pounds of each blow may be measured by the following formula. This is only theoretical and no doubt different in practice. Area of piston $\times$ pressure $+$ weight of piston $\times$ foot travel -5% for friction will give the total foot pounds applied. This, multiplied by strokes per minute will give foot pounds per minute.

In conclusion, I would like to impress upon those who have pneumatic tools under their care, the absolute necessity of giving them proper care and attention. It is of the utmost importance that hammers be oiled frequently during the day and once a week taken to the Tool Department, thoroughly cleaned and examined and any minor repairs attended to. The drills should be filled with grease or heavy oil. By this means the life of the tool will be prolonged, the cost of maintenance would be minimized, and the maximum services will be obtained from the tool. Motors and hammers should be equipped with automatic oilers. Fig. 10.

There is also another point which should be considered in buying pneumatic tools, that is to reduce the multiplicity of types. The efficiency of these tools should be thoroughly investigated and then as far as practicable, one type of drill and hammer should be purchased as the men get accustomed to using them and thereby can do better and quicker work, and the tool makers also get accustomed to the little defects and you require fewer parts to be kept in stock. Of course, I realize that it may be necessary to have larger or smaller drills and hammers to meet the different requirements of the work.

An important matter is to have chisel ends turned correct size and length. A master gauge should be kept for this purpose and all chisel ends for chipping hammers made to this gauge, hardened all over draw to dark straw color. Rivetting hammer snaps should be turned to size and gauge made and used to keep correct fillet in neck. Too large a fillet will likely split your barrel and too small a fillet will weaken snap, causing breakage at point where mostly all snaps do break. We have

had our share of trouble with broken snaps but this is overcome by stating your case to steel makers who will furnish you with special steel of low carbon to withstand shock and still have sufficient carbon in steel to harden properly. Those who do not deal directly with steel makers should procure a low carbon steel such as is usually used for chisels and drills. Always harden snaps all over, then draw back to required hardness.

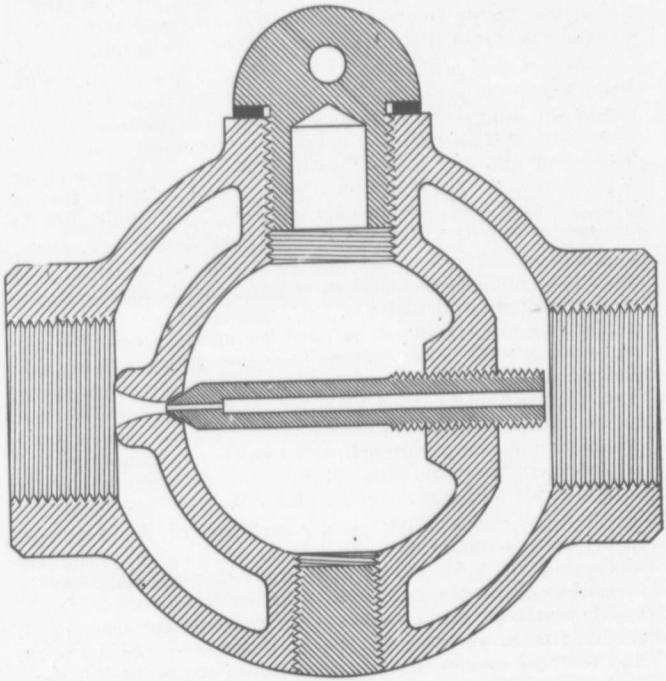

FIG. 10.

Another matter I would like to impress upon users is to never use a hammer that becomes loose at joint of barrel and handle. This quickly destroys face of valve block, faces of handle and faces of barrel. It also destroys power of hammer by allowing valve to reverse too quickly or not at all. This is caused by equalizing pressures and piston reversing too quickly.

The question of the saving of pneumatic tools is very broad as it would range all the way from 50 to 200%, but no doubt there are a number here who have had experience who will give us the benefit of their observations.

Mr. MacNicol,—

I was very pleased to listen to the address of Mr. Geldart to-night. The pneumatic tool is really becoming an absolute necessity. The engines are getting larger and therefore more work has to be done on them, and in order to accomplish all this work, pneumatic tools are necessary. At the same time pneumatic tools, I think, are being over run. Take for instance, there are a lot of erecting shops where they have installed large electric cranes to lift the engines. This work being formerly done by 8 laborers with four screw-jacks. The crane will probably cost $50,000, which means a daily expense of nearly $25, worked out as follows: interest on investment, deterioration charges, plus cost of repairs, one operator at $2.50 per day. power and supply charges. Whereas in olden days it would not cost more than $10 a day, and in nearly every case the shop output remains the same, although the crane will do the work in one-fifth of the time taken by eight laborers.

Then, again, there are lots of shops that use their tools for only a couple of hours a day. Do you think that pays? Some of the shops are putting in pneumatic grinders on the benches to save the men going to the grinding machines. I do not think this pays unless the distance to the grinder was too far, and if such was the case, there is something wrong with the shop arrangement. If the cost is accurately taken I think pneumatic tools will be found to be pretty expensive articles unless they are put in service, such as a pneumatic hammer, where it is kept constantly in use.

I may say regarding the question of pneumatic hammers, that we have very little trouble with them, but when we do, it is generally due, as mentioned by Mr. Geldart, to dirt in the valves. Our drilling machines for drilling staybolts and ordinary holes give very little trouble. I find our hammers probably receive a little too much oil. We use in the roundhouses a great many pneumatic tools of various forms, but I think the most convenient and one which has proven a great saving outside the air hammer, is the turntable motors. We used to have two men to turn the table, whereas to-day we have twice the weight to turn, yet can do this with only a man to operate the motor.

Mr. Stortz,—

I do not know that I can say anything in particular on this subject. I think there is a tendency to make a play tool out

of pneumatic tool work as Mr. MacNicol has referred to, but at the same time we cannot help but acknowledge that the pneumatic tool is certainly a tremendous labor saver in a great many respects. In roundhouse work to-day we would probably have to have double the amount of labor if it were not for the use of these pneumatic tools. Pneumatic tools are used in various forms to-day, and for various purposes. A couple of months ago I observed several men hammering away at some stone on a flat car, and I wondered why they did not use pneumatic tools in their work. I asked them if they ever used these tools for their work, and they replied that if we had this stone down at the shop they would not be doing this. I suppose it was a little easier for them to do it on the flat car than to take it up to the shop. This is merely to show that penumatic tools are used for various things.

I do not know that I can say anything further on the matter of pneumatic tools, as the paper to-night has pretty nearly brought out everything.

Chairman,—

Mr. Geldart, I would like to know what is the largest size rivets you drive with the pneumatic hammer?

Mr. Geldart,—

We drive them up to 1¼″ but that is for some special job.

Chairman,—

Do you find that very much trouble?

Mr. Geldart,—

The hardest service that we have ever known a hammer to stand is driving cold staybolts, that is trying to drive them after they are in their place. The sheets being brought up solidly together, and that forms a hard edge to pound on. This work is harder on a hammer than any other work you can put it to.

Mr. Brent,—

I have had very little experience with pneumatic tools, but what little I have had I notice that in the small shops the most trouble occurs. In the larger shops like Stratford, where they have a man looking after the tools after the operator is through with them, and who sees that they are properly oiled and looked after, you have very little trouble. But take in a small shop where the operator looks after the tools entirely and does not know much about them—when he thinks the

hammer does not work well with one oil, he tries another kind, and so on—that man sometimes condemns the tool because he knows nothing much about it. So far as I have seen, these tools give very good satisfaction.

Mr. McCabe,—

I do not see very much of these tools. On the question of large staybolts, I think from what I have seen, most of these split on being hammered cold. The blow is too constant, and I do not think that this way proves satisfactory. But, coming down to the question of using an air hammer, I think the biggest mistake lies in the fact that frequently too much pressure is put on the hammer or not enough. Sometimes you see hammers used on pressures of 70 and 80 lbs., which could just as well be cut down to 30 or 40 lbs. We have only one hammer at the Toronto Railway, therefore, I cannot say much in regard to hammers.

Mr. Duguid,—

I have had so much trouble with air tools that I have taken a dislike to them. If there is anything in a shop which will get the foreman into trouble it is air tools. I would rather handle a baby any day than them. I have seen a boiler maker using an air hammer, which he claimed would not work. You carry it up to the tool department and before you get there another fellow comes along with another hammer that will not work. You frequently find on putting these hammers to work in the tool department that they work all right. There are many cases such as this, if you take the hammer, which will not work, away, and give it a good shake without the operator seeing you, you will have no further trouble.

One important trouble with air tools is rough handling. An operator will handle an air tool as though it was a pinch bar. This is not altogether the man's fault, but it is simply the tendency of the times. A few years ago when I started my trade, the men took a great deal more stock of their tools then than they do now. You would often see a man then with a plush lined tool box, but not now. In a number of cases men have said to me when they were tapping holes, "If I do that I will break the tool." I have said—"Let it break." It is simply a case of the men being chased on the work and have not the time to look after their tools. It is simply the tendency of the times to rush the men, and if the tools will not stand, they have to break. But I do not know but when you come to figure it out, there is economy in this in the end, and you can afford to repair a good many more tools in order to get the work out quicker. As an illustration of this, the large shops at Stratford years ago had two tool makers to

repair the tools, whereas to-day there are employed some fourteen or fifteen men doing nothing else but repairing tools, not making them.

Regarding the economy in the use of air, Mr. Geldart says it runs all the way from 25% up. If you cannot make a saving of 100%, in my opinion, there is no use using it at all. If you are only making a saving of 25% you are going backwards. I think they carry the matter of air tools a good deal too far. Take for instance, they drive a power hammer by air, and they have other machines driven by air, such as belt shifters, etc. The only place where I think air can be used with economy is on air motors and hammers. While there is a great saving by the use of air motors on turntables, yet it would be a great deal cheaper—some 50%—to turn the tables by steam. Then again the electric motor on a turntable is much more efficient than air. The air hoist will cost you 25% more to operate than an electric hoist.

Mr. MacNicol said that they did not have trouble with the oil in their tools. Mr. MacNicol's shop is the only place I have ever heard where they have not had trouble with the oil in the air tools. The air hammer should certainly be oiled every thirty minutes to keep its parts from wearing.

I do not think that I can say much more regarding the efficiency of air tools. Electric tools and steam driven tools of any description could become just as efficient as air tools and more so. Any tools which can be operated by steam or any other power than air, can be operated at 25% less cost.

One of the troubles I have seen with air hammers is using the air too hot. The air compressors are of too low a capacity, and the air is being taken too quickly from the reservoir, therefore not allowing it sufficient time to cool off properly causing it to deposit moisture in the pipes. That only goes on for a short time until there is a layer of rust in the pipes, which, of course, stops up your tool. I think Mr. Geldart will back me up in saying that about 50% of the repairs to air hammers is due to water and rust in the pipes. In larger plants they have a compressor which gives 50 to 100% more capacity than is required.

I have not had the practical experience repairing pneumatic tools that Mr. Geldart has had, so that I cannot tell you about all the troubles met with in the use of air tools, however, I assure you that I have had trouble enough with them.

Chairman,—

We shall be glad to hear from Mr. Larmour. Mr. Larmour is the gentleman who so kindly assisted in the preparation of these fine drawings before us to-night.

Mr. Larmour,—

Although the chairman has said I made the drawings for Mr. Geldart, yet I know very little about this class of tools. The drawings were made entirely under Mr. Geldart's directions and I know nothing about the internal workings of these tools except what I have learned from Mr. Geldart's valuable paper.

I agree with what one gentleman has said concerning the question of pneumatic tools being over done. I think there is a tendency to over use them. They are loading the locomotive down with pneumatic and other appliances which I think could be left off, such as pneumatic fire door openers. I think the locomotive has about as much as it can do now to make steam; also if these appliances were brought into general use, they would likely be abused and found costly in repairs. The air hammers and drills, outside of railroad work, I think have shown themselves very efficient tools. I might mention that the work of rivetting and drilling in dry docks overhead is very tedious and laborious, but the air tools have overcome a great deal of this. I think they will save different trades fully 200% and upwards in labor.

The automatic oiler seems to deserve consideration from users of pneumatic tools, as it appears to be, to these tools, just what the sight feed lubricator is to the steam engine.

Chairman,—

Mr. Baldwin is a practical boiler maker and we would like to hear from him on this subject.

Mr. Baldwin,—

I have listened with a great deal of pleasure to the very interesting paper that has been presented to us to-night by Mr. Geldart. When you, Mr. Chairman, called for a practical boiler maker to make some comment on this paper, I looked around the room for an old, old man, because compressed air and penumatic tools have practically revolutionized the boiler making trade. I learned my trade as a boiler maker twenty-five years ago, when the hand hammer, chipping hammer, rivetting hammer, flogging hammer and sledge were the prinicipal tools we used, but owing to losing my hearing I was compelled to quit the trade, and in my present capacity as yardmaster, I have to-day been experimenting with another kind of air. We had a very sick horse, suffering from colic or wind on the stomach, and we used oil to get rid of the wind, but we did not use the oil through an automatic oil feeder, but a common quart bottle. (Laughter). With reference to the remark by Mr. Duguid, that he had experienced trouble in transmitting air a long distance from the compressor, owing

to moisture, which caused corrosion, I may say that at the Canada Foundry we have upwards of a hundred pneumatic tools in operation, some of them working at a great distance away from the compressor, and we found (especially in winter time) great difficulty in overcoming the moisture which had accumulated, so, a kind of super-heater was installed consisting of several coils of the air delivery pipes being encased in an improvised furnace, heated by cord wood, and which successfully remedied the difficulty. Mr. Geldart has placed the subject of pneumatic hammers and drills so exhaustively and in such an able manner before us, that I find I am unable to enlarge upon it, and think the same as the rest of the members present, that Mr. Geldart, together with Mr. Paterson and his draughtsman deserve the warmest thanks of this Club; and in conclusion I am of the opinion that boiler making has received more benefit than any other trade from the introduction of air tools and, Mr. Chairman, I thank you for calling upon me.

Mr. Wickens,—

It is getting pretty late and therefore I will not say much. I have not had much experience in the use of these tools, but for a number of years it has been in my province to inspect boilers, the work on which has been done largely by pneumatic tools. The present day rush causes men who are using the tools to slip over their work, and we often find work on the boilers which would not have occurred in the olden days when they did not rush the men so fast. There is no question about the usefulness of pneumatic tools and their saving, especially on boiler work, yet there is sometimes a little trouble when the Inspector comes to look over the job. But you can only blame it to the shop rush. When a man, who is using a pneumatic tool, is compelled to rush his work, he is very apt to not make as good a job as though he were not rushed. This is a point which strikes the inspector most particularly.

Mr. MacNicol,—

If our chairman will permit, I would like to have Mr. Wickens explain to us where the principal difficulties occur in pneumatic tool work on boilers.

Mr. Wickens,—

I did not expect to get drawn into this matter this way. I did not purpose to say that the pneumatic hammer should not be used. I believe that they are a means of doing exceedingly good work. I believe that if they were properly used we would always get good work. I will give you one or two instances which I came across not long ago. I inspected a

boiler on which the operator had used a pneumatic chisel, and apparently had held it in such a manner that he scored the lower plate off all the way around. That is one point that has come under our notice lately. Sometimes the operator does not hold the tool squarely, and we get a rivet that is closed down on one side and not on the other. We get a nasty ragged fin sticking out on the side of the rivet. Sometimes they are tight, and sometimes not, and after a time we find that the sheet is being corroded a little at these spots by the action of the gases. In these days they roll the sheets so that they will go together tight and they do not need plying down with a flogging hammer like in the olde: days. We find a good deal of good work as well as some bad work when we go to inspect.

Chairman,—

While these gentlemen have been talking along the lines of advantages and disadvantages of penumatic tools, I was thinking that some few years ago a company with which I was connected, gave an order for some steel tank work. The contract was in the neighborhood of $250,000, and the work was done by an old country firm. Men were brought over from the old country and a firm on this side supplied the pneumatic tools. The foreman in charge was an expert in this work, and I doubt very much whether he has very many peers in this line. As soon as he started in to use the pneumatic hammers he commenced to have trouble with them. The hammers began to break and he came into my office and said: "I do not know what to think of these hammers as they are the first ones we have ever used. I believe I can make better time by hand work and put in the rivets by piece work. If the cost of the erection of this job goes under a certain amount, I get a third of the profits, therefore, it means a great deal to me". I was busy at the time and the job was a little distance away, and I suggested that perhaps the men were not using the tools properly. He said he had the best men on the job, and I therefore suggested that we get the best tool maker in town to go down and help him out. I took him to a firm and arranged for their expert to go up to the job, but these tools were a little out of his line of business. In the meantime he was doing the work by hand, and as the firm wanted him to persevere with the job, he finally decided to cut out the pneumatic tools and do the work entirely by hand. However, before doing this the pneumatic tool people sent their expert over and he said that the rivets were a little larger than they were used to, and this caused the trouble with the tools. But I really believe the trouble was due to the fact that they did not have a tool maker on the job. They finally sold the

equipment and finished the job by hand and went back to the Old Country. Some two or three years after that, that same gentleman came back to this country to do some work for us again, and he called to see me and I said: "Are you using the pneumatic tools in the Old Country yet?" On leaving Canada he went to Wales, then to Belgium, and by the time he got back to Scotland, he said that there was a class of hammers out which gave a great deal better satisfaction to them. I think there is a great deal in having somone around to take care of the hammers. I have no doubt that these men will bear me out when I say that when they first started with these hammers they wished them in the bottom of the lake. The case I just cited shows a firm spending a great deal of money in adopting these pneumatic tools and they proved a failure, but since that time the hammers have improved so much that to-day they are a success. I just brought this matter up to show what opinion you can form of tools in their infancy.

I would like to again hear from Mr. Geldart.

Mr. Geldart,—

The remarks of Mr. MacNicol and Mr. Duguid have proven that it is frequently the fault of the operator and not of the machine. Often the operator does not understand just how these tools work and there are so many that do not get a chance to find out this information. The object of my paper to-night was to show how the pneumatic hammer works. It is certainly a beautiful and ingenious tool and it is well worthy of any mechanic's careful attention and study. What Mr. Duguid has said is quite true, we frequently find a piece of the hose line stuck in the valve which stops up the tool. Regarding oiling, you will find the automatic oiler which I showed you, will save you considerable trouble.

Mr. Burrows,—

I have much pleasure in moving a hearty vote of thanks to Mr. Geldart. I have been a pretty regular attendant of the Club since its inception and I do not think we have heard a better paper. As was said at the beginning of the meeting, it is no easy matter for men who are working every day at their various occupations, to prepare a paper, and for this reason we appreciate it all the more, especially as it comes from a practical man. I do not think we should forget about Mr. Patterson, Master Mechanic at Stratford, who so kindly placed at Mr. Geldart's disposal every assistance. Also we have to thank Mr. Larmour for getting up these fine drawings. I again take very much pleasure in moving a very hearty vote of thanks to these gentlemen.

Seconded by Mr. Baldwin and carried.

Chairman,—

Mr. Geldart and Mr. Larmour, I wish to extend to you the vote of thanks of the Club for your kindness in coming down to-night, and I trust you will convey to Mr. Patterson our sincere thanks for his share in the matter. In order to show our appreciation, we trust you will all come down and attend our picnic at Jackson's Point.

Mr. Geldart,—

I thank you on behalf of Mr. Patterson and Mr. Larmour for the vote of thanks. As I said before in starting out, if I have made the working of these tools clear to you, I feel amply repaid, and I am sure that Mr. Larmour feels the same.

Proposed by Mr. Baldwin, seconded by Mr. Duguid, that the meeting adjourn. Carried.