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OFFICIAL PROCEEDINGS

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PROCEEDINGS OF THE CENTRAL RAILWAY AND ENGINEERING CLUB OF CANADA MEETING

COURT ROOM NO. 2, TEMPLE BUILDING,

Toronto, February 25th, 1913.

The President, Mr. A. M. Wickens, occupied the chair.

Chairman,—

The first order of business is the reading of minutes of previous meeting. These were published in the January Journal and as you all had a copy and have no doubt read same, it will be in order for someone to move that the minutes of the previous meeting be adopted as read.

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

Chairman,—

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

I do not suppose that you expect me to make an elaborate speech every night and I do not intend to make one to-night.

I am very sorry that there are not more members present to-night but those who are here will I am sure be well repaid for coming. I understand there are two banquets on to-night in which a good many of our members are interested and no doubt that will account for a good many of them.

I think all will agree that our dinner the other night was a great sucess, we all had a good time and a very agreeable evening was spent. We hope to have something in the entertainment line in March which I know will be appreciated by the members.

I want to call your attention to our Monthly Journal again. There are a lot of firms advertising in that Journal and we have a great number of members who require such goods as are advertised and it will help the Executive quite a lot if the members will write the advertisers and ask them for their prices. If there is anything advertised in this book that the members want to buy if they will simply write to the advertisers and say that they saw their advertisement in the Club book they will materially assist the Club. You will readily see that the amount you pay in dues would not begin to pay for the Journal and it would be necessary to pay three or four times as much in dues if it was not for the advertisements appearing in this Journal.

I learn with pleasure that our Past President, Mr. Bannon, is improving in health and that there is every hope of his eventually recovering.

The next order of business is the reading of list of new members:—

NEW MEMBERS

Mr. W. E. Oliver, Engineer, Representing Canada Foundry Co., Toronto.

Mr. W. Burgess, Superintendent, Don Valley Brick Works, Toronto.

Mr. W. Kirkwood, Road Foreman, G. T. R., Stratford.

Mr. A. Matthews, Fitter, Patternmaker, Gurney Foundry Co.

Mr. J. A. Walton, Locomotive Foreman, G.T.R., Palmerston.

A. J. Miles, Boilermaker, G.T.R., Stratford.

H. Lamont, Manager, Toronto Testing Laboratory Limited, Toronto.

Mr. F. G. Mahaffy, Truck Manufacturer, Toronto

Mr. C. A. Bird, Representative, The Bird Archer Co., Toronto.

Mr. J. A. Sherwood, Manager, Thomas Firth & Sons, Limited, Montreal.

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Chairman,—

The paper for to-night is by Mr. E. A. Wilkinson on "Stop Valves" and I am sure that Mr. Wilkinson will be able to put the matter before you in such a way that it will be very interesting..

The paper for next month will be entitled "First Aid to the Injured" by Dr. Cannon of Stratford. This is going to be an extra good night. There is no person in any walk of life who may not at some time be called on to relieve some one and a knowledge of First Aid is almost indespensible to men working in shops and manufacturing plants, where knowledge of this kind might be the means of saving someone from bleeding to death and enable them to alleviate suffering until such time as medical attendance could be secured. The Doctor has spent a great deal of his time along this line and he has prepared an elaborate paper and as he is coming from Stratford I hope that there will be a big turnout of members. I am satisfied that the paper will be well worth listening, and I am quite satisfied that the paper we are going to have to-night will be entirely acceptable to our members and we should have an interesting discussion after the paper. I will now call on Mr. Wilkinson.

"STOP VALVES"

By E. A. WILKINSON, TORONTO.

In order to make this paper interesting and instructive it will be necessary for you to co-operate with the speaker. It is possible that the speaker will learn more from the discussion than you will learn from the paper. It is my hope that it will be mutually beneficial.

The intention of this paper is to give some hints on this subject that may be of aid to anyone taking up this question with a view to deciding what valves are best suited for the different work from standpoints of efficiency and service.

The word valve is from the Latin "Valva" which means a leaf of a double door and applied to mechanics signifies an appliance so fitted to a vessel or tube as to control the passage of liquid, gas or vapor into, from or through the vessel or tube.

Probably the most ancient form is the leather flap valve used still on small pumps and with which we are all familiar.

We will confine our discussion to-night to one class, viz.—Stop Valves of which we have samples and blue prints here.

Before we begin to examine these it may be as well to consider the whole question hurriedly.

We will assume that you are about to look into the valve question with the idea of installing the most satisfactory in the plant for whom you are acting as consulting engineer. Before you start this investigation you will have had considerable experience in handling valves and you will have difficulty in approaching this subject free from prejudice.

To decide what valves will give you most satisfactory service the best way, of course, is to make practical tests with different styles of the product of different manufacturers. Use more than one of each as something may happen in testing a single valve that would lead you to wrong conclusions. If you test these valves under actual service conditions and if your test is properly conducted it should show you what valves are best suited to your purpose. But this method is not always convenient. So we will suppose that you get different types and makes of valves before you and you now want to make a wise selection.

The name of the manufacturer should be cast on the goods. You should consider what general reputation these goods have and what experience the manufacturer has had in developing the product. These considerations should bear some weight.

Examining the goods more closely you will ask yourself as to the general appearance of the valves. If a manufacturer is careful of the the general appearance of his goods you will know that he takes pride in his product. The dress of a man has quite an influence with us in the opinion we form of him and also with the regard he has for himself and so it is with valves. They should be well proportioned and symmetrical, nicely machined and finished; in short, good to look at.

When we have gone this far the next step will be to take the valve to pieces and inspect each part and find the relation it bears to the whole. The castings, of course, should be flawless and the machining smooth and perfect. The scheme of seating is one of the main things to consider and here you will have to bring to bear your mechanical knowledge to determine if the method employed is the most approved. As to the wear or service that the seating surfaces will give: You will have in mind that the harder these surfaces are the longer they will wear. The threads on the stem and in fact each detail you will consider carefully.

By this time you will be curious to know what material enters into the composition of the valve. This you can discover from analysis of the metal and as perhaps this is the most important feature we will have something to say about this

matter of Alloys further along. The question is often asked "Can I determine from the color of a bronze valve about what the composition is." You cannot tell definitely. If the metal is bright yellow, that is a brass valve. You will note that we here draw a distinction between brass and bronze. While the general term of all mechanical mixtures of this class is brass still we prefer to use the word bronze to distinguish this strong and hard metal from the ordinary yellow brass which runs high in zinc and lead and is absolutely worthless as a steam metal. If the valve you examine shows a rainbow of colors there is an evidence of poor foundry practice but we will go into this more fully later on.

Perhaps the most important point then arises; you ask "Do these valves admit of easy repair?" All parts should be absolutely interchangeable and the construction such that the wearing parts can be replaced or repaired without removal from the pipe line. This is very important.

Look at the packing. This should be a good, quality, semi-plastic, molded ring packing, well lubricated. There should be a beveled gland follower to keep the packing in place. If the valve is not packed do not consider it at all as you will know at once that this valve has never been tested. There are some valves that come to you packed that have not been tested but certainly a valve cannot be tested unless it is packed. To test and inspect valves costs the maker a pile of money but it is the only way that they can be certain that when you receive the goods that they are perfect. The valve should be so made as to admit of being re-packed under pressure.

The use of the union ring for fastening the hub to the body is a splendid feature in the small bronze globe valves. This method has never been equalled for adding rigidity to the body and at the same time making a joint which absolutely makes it impossible for steam to reach the union thread and so corrode the parts together. It cannot release and allow the trimmings of the valve to blow out.

Do not use the scales to select your bronze valves. If you select a valve on account of its weight you will likely buy a great deal more lead than you bargain for.

The distance or clearance between the threads and the diaphragm on the globe valve should be considerable so that there will not be a chance of distortion if the connecting pipe is threaded too long. The internal areas should be generous and the smallest area greater than that of the nominal diameter of the connecting pipe. The distribution of metal in the valve body should be such as to have the most metal where it is needed to gain rigidity and prevent distortion.

You will have a variety of uses in your plant for stop valves. With your permission we will not discuss the handling of cor-

rosives such as ammonia, alkalies, cyanides or acids because these demand special treatment. But you will likely have, oil, air, cold water, hot water, steam at low and high pressure, saturated and perhaps superheated. Now if it is possible for you to get one valve that will handle all these conditions successfully you will have gained a most important point in that your equipment will be uniform.

As we have said we are considering all the points a good valve should have so that the maintenance of this portion of the equipment will be reduced to a minimum. This question of maintenance is the point that is receiving the careful attention of all the best consulting engineers to-day. While a valve should admit of easy repair we do not want it to wear out too quickly. The speaker has occasion to visit some plants who keep a staff of two or three men engaged in doing nothing else but repairing valves, due to faulty construction of the valves. This is very poor economy. But the prevailing argument of the factory owner of such equipment is that the valve is easy to repair. Some repairs will be necessary so see to it that you can get these from your jobbing house or dealer quickly. It is hazardous to buy valves from a small firm who are not well known as by the time you want repair parts they may be out of business.

When you have installed your valves see that your mechanics understand their construction and method of repair. Just recently the speaker saw about two hundred dollars worth of valves being sold for old brass because the engineer said they could not be repaired. As a matter of fact they could have all been put in first class condition for twenty dollars. When you install expensive equipment see that you get a first-class man to look after it.

After you have taken up all these points the vital one at the end may be the price. If you want the best you will not be able to buy them cheap. To get the best value buy the best goods. They will give you comfort, satisfaction and long service. For high pressure work be sure to always get Extra Heavy goods. They are well worth what extra they cost.

Would say here that very often valves used exclusively for throttling purposes are one, two or three sizes larger than necessary. If smaller valves are used in such cases a lot of trouble will be avoided because the effect of the wire drawing condition will then be reduced to a minimum.

Very frequently a boiler compound is used which results in the formation of a fine salt or sediment some of which is carried over with the steam producing a sand blast action which is very destructive ro valve seats and discs and sometimes even to the body castings.

We will now take up some of the different types of Valves.

The Globe, Gate, Check and also that most important valve, The Blow Off.

The needle valve for fine regulation requires no special reference.

First the *Globe Valve* (Fig. 1). This class is again subdivided into the Globe Valve proper, *the Angle* and *the Cross*. The seating arrangement in these three is practically the same. That is a diaphram extends across the inside of the body with a port at right angles to the stem. This port has the same diameter as the nominal diameter of the pipe connection. Into

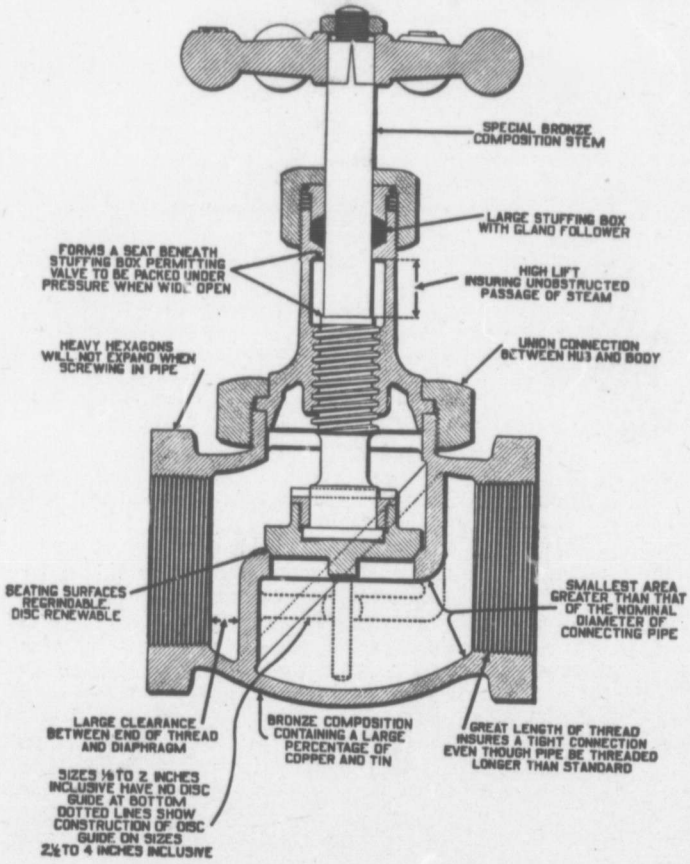


Fig. 1.—Illustrating specifications for Globe Valve.

or onto this port the disc governed by the stem or spindle is seated making the joint. This type of valve is used in controlling or throttling and is one the most generally in use in the smaller sizes. It is made in bronze regularly from 1-8 to 4 in. and in Iron Body Bronze Mounted from 2 in. to 12 in. although, of course, you can obtain bronze valves up to 8 in. These are made either screw or flange ends with inside thread or Outside Screw and Yoke and in different weights for the different pressures and temperatures.

It will be as well before we proceed further to run over the names of the parts of the valve:—

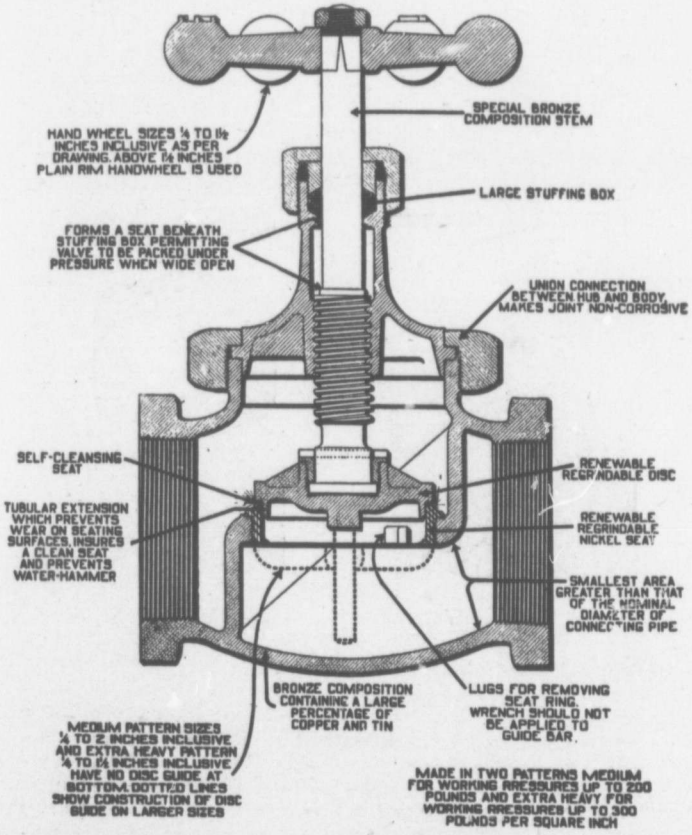


Fig. 2.—Showing renewable disc and seat Valve. With self cleansing nickle seat.

1, Body; 2, Hub; 3, Ring; 4, Stuffing Box; 5, Stem or Spindle; 6, Disc; 7, Locknut for Disc; 8, Gland; 9, Hand Wheel; 10, Seat Ring; 11, Locknut for Hand Wheel; 12, Packing; 13, Yoke.

The names of these parts will be the same in considering all types of stop valves so far as they apply.

The parts subjected to the greatest wear are the seat, disc and stem and these should admit of easy repair or renewal. There are two conditions that cause seat bearings to wear quickly: Scale and throttling. That is if you close a valve and catch hard scale between the disc and seat and screw down tight the scale makes an indentation in the bearing faces which will cause the valve to leak. Also if you just turn the hand wheel a half turn and allow the pressure to force through this contracted opening the faces will be scored by the resulting friction or erosion and again the valve leaks. So too, in a less degree, the particles of water in saturated steam will cut any metal in time. We will say nothing of the man who puts lye in his boiler. He should use valves made of all Iron:

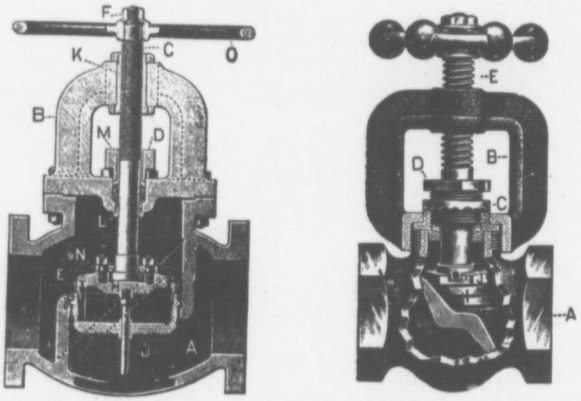


Fig. 3.—Globe Valves showing outside screw and yoke

no Bronze composition will stand that. In throttling you should use two valves. Use one to throttle with and the other for your stop valve. But as these two conditions are everywhere prevalent and hard to avoid your valve should be constructed to take care of these conditions. First: The disc and seat bearings should be made of the hardest, non-corrosive metals obtainable so as to withstand the errosion as well as possible.

Second: the valve (Fig 2) should have some device for cleaning its own bearings free from foreign matter. This can be ac-

complished by having the valve make a fine spray travelling across the face of the bearings just before the valve comes home to seat.

Also instead of throttling with the face of the disc this should be accomplished by an annular extension of the disc.

Now the threads in the stem should be carefully looked to. These should be heavy and cut smooth. When the valve is closed at least five complete turns should remain in the hub. The stem itself should be of a harder composition than the hub to secure a better wearing effect. If conditions are such that a fine scale gets down into the threads and cuts them out you should use an Outside Screw and Yoke Valve (Fig. 3). This will keep the threads outside the action of the steam and also permit oiling. Sometimes it will be simply necessary to set the valve with the hand wheel upright to overcome this trouble.

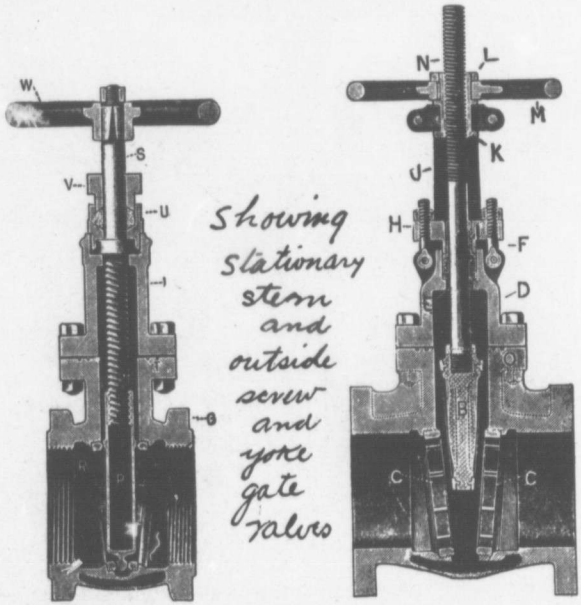


Fig. 4.

If a valve is not used for throttling you can use a Gate Valve. That is if you use a valve wide open or tight shut. Gate Valves are divided into straightway and angle gates. And are made two ways, with stationary stem and Outside Screw and Yoke for a variety of temperatures and pressures. (Fig 4)

Usually they can be had up to 4 in. in all Bronze and from 2 in. up in Iron Body Bronze Mounted. Naturally the friction in passing gas or fluid through a gate valve is considerably less than if a globe valve is used. For this reason more gate valves might be employed. To make a good gate valve costs more money than to make a globe valve. Many cheap gate valves were poor appliances. This is not true. A gate valve should admit of easy repair but on account of their construction they are harder to get at than a globe valve. However, the same rule applies to gate valves all parts should be absolutely interchangeable and the wearing parts easy to repair or renew. In a gate valve we would look to see that both the seat rings and the discs were renewable. However, when you put in a gate valve

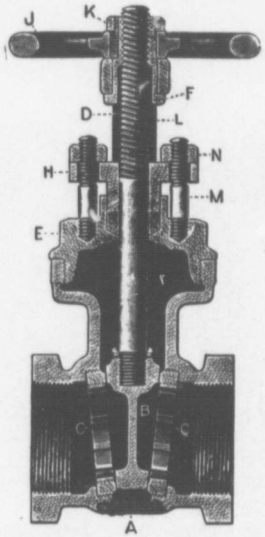


Fig. 5.—Sectional view of Valve with outside Screw and Yoke.

put in a good one and you should expect it to last a long, long time without needing any attention. As we have said we find two general types of gate valves: the Stationary Stem and the Outside Screw and Yoke Valve. The O. S. & Y. valve is preferred because you can tell from the position of the stem if the valve is open or closed. The stem threads do not enter into the valve and are therefore not subject to corrosion and they can be oiled. Construction in a good gate valve calls for the discs to be tapered and the disc

should seat on both sides. This gives you double security. Some old styles had straight plug discs that wedged out to the seats by the pressure of the stem screwed down inside but these have been discarded (Fig. 5). The solid wedge disc is the most reliable type of gate valve although a very good double disc gate valve can be made with ball and socket joint up to 3 in. for moderate pressure. The larger gate valves are sometimes

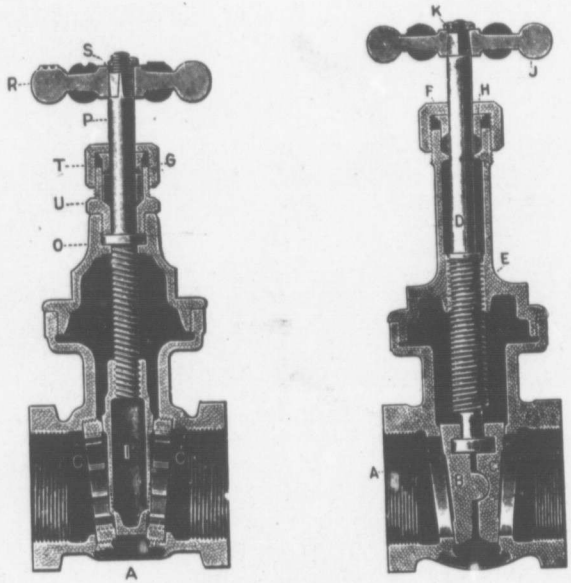


Fig. 5.—Some types of brass gate Valves.

fitted for operation by a chain connection to the hand wheel. Also with gear lift and hydraulic or pneumatic lift.

There is also a quick opening type of gate valve as shown here very " handy" for handling steam, water, liquors, syrups, etc., and used for testing and a number of different purposes. (Fig. 6). More flanged valves in both the globe and gate type should be used and especially in the larger sizes rather than screwed valves.

Valves from 5 in. up are often fitted with by-passes (Fig. 10), especially for the higher pressures. It is a good plan in connection with by-pass valves to have two valve seats so that you are always ready for emergency. If one seat goes out of commission you change your valve trimmings to the other side

and cap the old valve. The extra heavy globe and angle valves in the larger sizes for high steam pressures should be fitted with internal by-passes.

(Fig 7.) There is nothing in particular to be said of the angle gate valves. They save a fitting and are very handy where space is limited. They are used on boiler headers, etc. The same construction is used as in the straightway.

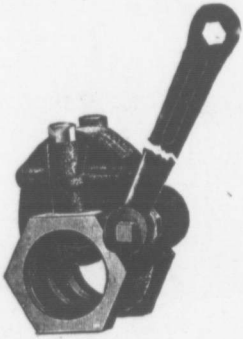


Fig. 6.—"Handy" Gate Valve

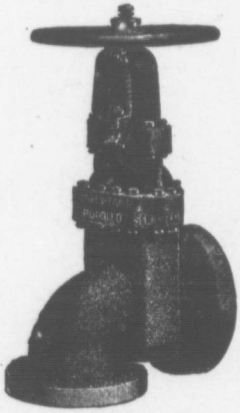
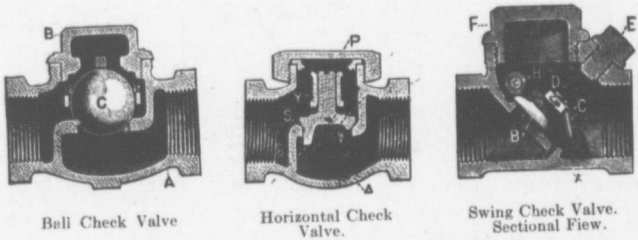


Fig. 7.—Angle Gate Valve

The next type of stop valve is the check. (Fig. 8.) This class is divided again into *Swing Check, Ball Check, Lift Check.* These are made from 1-8 in. to 4 in. in bronze and from 2 in. to 12 in. in Iron Body Bronze Mounted in both screwed and flanged ends and for a variety of pressures and temperatures. The swing check may be used in either a horizontal or vertical position and in the other styles there are horizontal, angle and vertical patterns. The swing check is the most approved type as it gives longest service and can be easily re-ground on the pipe



Ball Check Valve

Horizontal Check Valve.

Swing Check Valve. Sectional View.

Fig. 8.—Showing the different types of Check Valves.

line. The operation of the swing check is easier than the others and it has full areas and straightway passage. The lift check makes the best valve for air and it can also be re-ground very easily on the pipe line. The ball check is now used mostly in the small sizes. As it is impossible to get brass balls perfectly round check valves do not seat as accurately as the other types, and for this reason should be selected with discrimination.

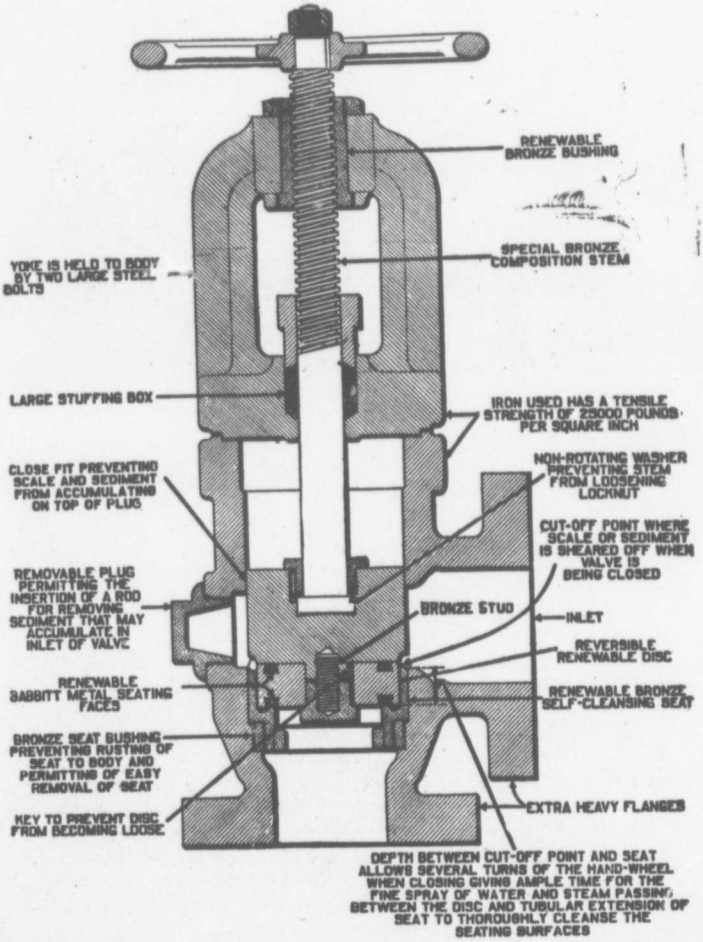


Fig. 9.—Showing method of Cleansing Seat.

(Fig. 9). The engineer formerly had his greatest trouble with the Blow-off Valve. It has been the custom in nearly all plants to blow down about twice a day to get rid of the dirt and scale in the boiler. It was this dirt and scale that ruined the valve. For a long time a cock was used but it was impossible to keep these tight for any length of time because the scale cut out the bearing or else the plug would stick. Then a quick closing valve was introduced that claimed to shear or cut off the scale but a quick closing valve in this position is not a good arrangement as the operator must close it with a jerk and this results in water hammer. The valve most successful in

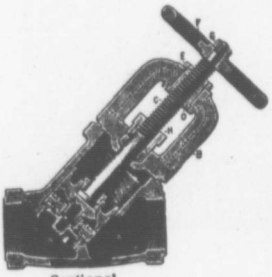


Fig. 9.—Straightway Blow-off Valve.

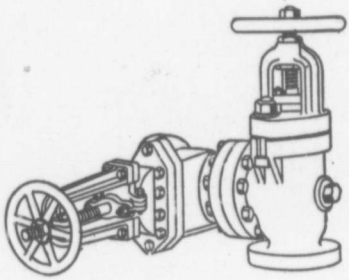


Fig. 9.—An Ideal Blow-off Combination.

this connection is a big heavily built valve that closes moderately fast, spraying off the seat and disc as it travels home. The seat and disc of this valve admit of easy repair and renewal.

Now we have run over the valve question and should be prepared to consider how far it as possible to use the same type and make of valve for all our purposes; viz; for air, cold water, hot water, steam, saturated and superheated.

If it is a bronze valve we will have to consider carefully that some of the so-called bronze valves contain as high as 14% of lead; some run high in zinc. These would be useless for almost any work and would not do at all for high pressures or superheat. The basis of any bronze is copper. Tin is mixed with this to gain hardness and strength. It is unfortunate for the consumer and manufacturer that they know nothing but tin that they can use for this purpose as it is so very expensive. If you find just a trace of lead and zinc in the valve it can be still reckoned a good steam metal as both zinc and lead are useful in making sound castings and from a machining standpoint. So if your bronze valve runs high in copper and tin and the lead less than 2% you can use it under almost any con-

dition and up to 500 degrees temperature and at the pressure the valve was designed for.

So in Iron Valves. Cast Iron is an alloy of elements just as bronze is. Where a bronze is a mixture of copper, tin, zinc,

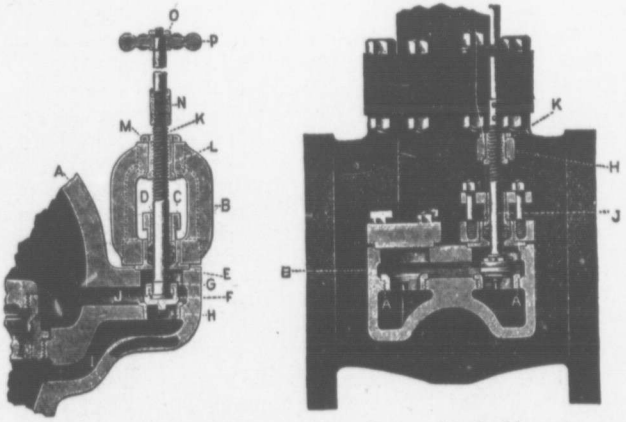


Fig. 10.—Showing by-pass in Gate Valve with double seat.

and lead; iron as it comes in the crude or pig contains in addition to the iron, graphite, sulphur, phosphorus, silicon and manganese. When the valve foundryman wishes to obtain an iron alloy for your high pressure and high temperature work he gets the proper adjustment of these elements in the iron by judicious mixing. He devotes his first attention to the graphite or free carbon, the sulphur and phosphorus. These weaken an iron, the latter two make it short or brittle. One of

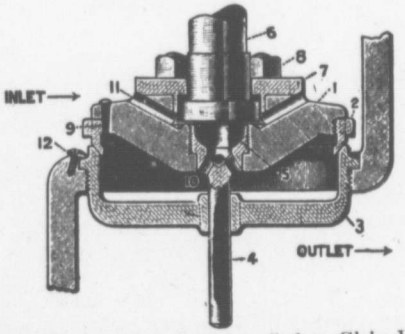


Fig. 10.—Showing by-passes as applied to Globe Valves.

the most successful developments in this department has come about in the manufacture of Puddled Semi Steel which is a remarkably pure cast iron of high tensile strength. This is made in a small oil-air furnace of special design. Puddled Semi Steel must be distinguished from the so-called Fero-Steels which are made in a cupola where the admixture of the steel with the iron is beyond control, and the resultant metals sadly lacking in uniformity. Puddled Semi Steel is absolutely uniform, close grained and the strength is 100% more than ordinary cast iron. This metal has been developed for high pressures and superheated steam and is entirely satisfactory. If your temperatures should run above 600 degrees you will begin to enquire about Steel Valves but these very high temperatures are, in this country at least, almost unknown.

As we have seen that high pressure and superheat conditions demand something better than Cast Iron we would expect that common steam metal bronze would hardly be good enough for these exacting conditions. And in a measure this is what we do find. Monel metal and high grade nickel alloys and special bronzes are taking the place of the ordinary bronze for the wearing parts of these high pressure goods. They are absolutely non-corrosive and very close grained. If used as a valve seat for ordinary purposes they should last indefinely.

Before concluding this portion of the paper we might say that the mechanical man of the last era gave small credit to the metallurgist and chemist. To-day no big institution would attempt to operate without a physical and chemical laboratory in charge of an expert chemist and metallurgist. He is held in high esteem in the foundry and it is owing to his efforts that the product has been brought to its present high degree of efficiency for the varying demands of the trade. The old rule of thumb in foundry practice is a thing of the past and guided by the advice of the metallurgist the practical foundryman can obtain the results they are striving for. The physical and chemical laboratories of the modern foundry have every apparatus for testing and analyzing and as much thought and care is given in the development of the up to date Engineering Appliance as is given to the construction of a Dreadnought or the twenty story skyscraper.

After you have decided on what valves you will select you will have to be careful in the erection of your piping and attaching valves.

To convey steam from a boiler to the engine or other apparatus would at first seem a problem easy to solve, but in most cases it is found that the cause of bursting pipes and their fittings is due to the incorrect method of erecting the piping, and not to any defect in the articles themselves. Pipes and their fittings, as a rule, will withstand a stress of from six to ten

times the pressure under which they are intended to work, nevertheless constant annoyance, danger, and sometimes wholesale disaster, is caused by steam pipes and their fittings, solely because of false erections, and to any one or a combination of the following troubles may be attributed the break-down:

WATER HAMMER,
EXPANSION OR DISTORTION,
WANT OF ALIGNMENT,
EXCESSIVE TEMPERATURE AND VIBRATION,
INTERNAL AND EXTERNAL CORROSION.

WATER HAMMER—The exact nature of the phenomenon known as "water hammer" has never been clearly defined, though its effects are only too well known to every engineer, the cause arising from an accumulation of condensed steam in the pipes or fittings. Should steam be suddenly admitted to a pipe partly filled with cold water, the latter will be set in violent motion and travel the length of the pipe in the form of waves, and will gain sufficient velocity to rupture any valve, blank flange, or other obstruction in its path. The extent of the rupture depends on the velocity of the incoming steam; for instance, if the valve controlling the entrance of the steam to a pipe partly filled with water is opened suddenly, a violent explosion is almost certain to follow, but if the valve is opened very gradually, while there may be a certain amount of noise and vibration, no serious results will occur.

EXPANSION:—To expansion and contraction can be attributed most of the trouble arising from leaky joints. Too much stress cannot be laid on the importance of proper provision for expansion, nevertheless the same is often overlooked.

Bends are frequently used to take up expansion strains, and the number of joints is materially reduced. When used for purposes of taking up expansion, it is well to make them as light as is consistent with safety.

WANT OF ALIGNMENT:—Want of alignment sometimes causes trouble by throwing excessive strains on the flanges of stop valves, separators, etc. This is brought about, as a rule, by the flanges having been forced into contact with each other by means of the joining bolts instead of fitting into place as they should.

The flanges of modern steel pipes and valves are usually of ample thickness, and if they do not come together fairly, they should be taken down and replaced and a thin ring of metal put in to make up the length, if necessary.

When erecting heavy pipes, every length should be placed in position and properly supported and leveled by its own slings and brackets, when it will usually be found that several lengths have to be altered before the flange faces come into alignment,

and not until this has been done and every pair of flanges inspected by some responsible person, should the various lengths be bolted together permanently.

VIBRATION:—When a number of small or moderate sized engines are connected with the same pipe system and stand on the same foundation, or at least in the same building, it is sometimes difficult to prevent the pipes from vibrating and at the same time insure the necessary freedom for expansion and contraction. Matters should therefore be arranged in such a way that the pipes are quite free to move in one direction, parallel with their length, movement in other directions being restricted as far as possible.

CORROSION:—If the feed water contains lime salts, the latter will deposit in the economizer and feed connection and more or less effectually protect the pipes from internal corrosion, but if the water is free from lime, and air is introduced by the feed pump, internal pitting will be set up and probably do considerable damage before it is discovered and steps taken to prevent further mischief.

External corrosion does not as rule, give much trouble, but under certain conditions the combined action of heat and moisture on asbestos pipe covering will set up pitting. This, however, can be prevented by painting the pipes with any good graphite paint before the covering is applied.

REMARKS ON ATTACHING VALVES:—Too much stress cannot be laid upon the subject of properly attaching valves, and while it is far from our intention to cast aspersions upon the ability of the vast number of steam fitters, engineers and others who are constantly engaged in construction work, yet a few remarks regarding this important matter will not be out of order.

When lead pipe joint grease is used, we would recommend that it be put on the pipe end and not in the valve, as when the steam is turned in, this stuff is carried to the bearing parts of the valve, and owing to its sticky nature, catches and holds grit and scale on the seats and discs of said valve to its great detriment.

Would also call attention to a bad practice that is sometimes followed in screwing pipe and brass valves together, i.e., using extra long pipe tongs or wrenches and placing same on the hexagon farthest from the pipe end which is being connected, as when this is done no matter how heavy the valve body may be, it will tend to spring the seat and place the same out of line. In screwing on to pipe, always close valves tight so as to make them as rigid as possible. Use a moderate size wrench and place same on hexagon of the end that is being attached.

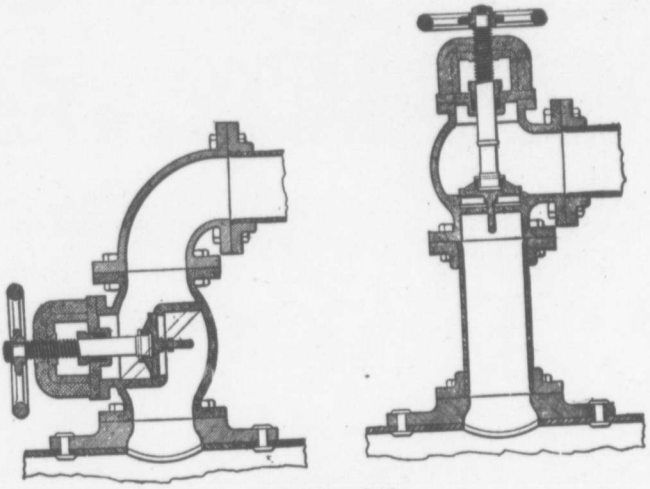
Piping should be cleaned out before being screwed into position, and if possible, the line should be blown out after the

valves are in place. Unless this is done, loose scale or metal chips remaining in the pipes may injure the seats or discs, causing leaks and necessitating regrinding, reseating, or removal of the discs.

A valve should not be allowed to carry the weight of a line of piping, as this may spring the seat. A hanger properly placed has sometimes remedied the trouble of a leaky valve, which could not be kept tight before the use of the hanger.

HOW TO OPERATE A VALVE:—Steam valves, and especially large ones, should not be opened quickly at any time, for should water accumulate in the pipe, water-hammer will immediately result.

Nearly all valves have handwheels of large diameter enough to easily control the opening and closing of the valve under pressure. It is not not necessary, therefore, to use a wrench on the handwheel to secure additional leverage.



Figs. 11 and 12.

Should a globe valve leak slightly, considerable damage often results by applying additional leverage to the handwheel to obtain a tight joint. The valve should be reground as soon as possible to secure a tight joint.

POSITION OF VALVES:—In placing stop valves, the first and most important feature is to ascertain whether the valve will act as a water-trap for condensed steam.

Fig. 11 illustrates a common error in the placing of valves, as this arrangement permits of an accumulation of condensed

steam above the valve when closed, and should the engineer be careless and open the valve, suddenly, serious results would follow, owing to water-hammer. Fig 12 illustrates the correct method of placing the valve. It sometimes occurs, however, that it is not convienent to place the valve as shown in Fig. 12, and that Fig. 11 is the only manner in which the valve can be placed. In such cases, the valve should have a drain, and this drain should always be opened before the large valve is opened.

I could cite a number of instances regarding the wrong manner of placing valves, but if the party in charge of the erecting will always take into consideration the question of drainage, and arrange the pipes and valves to overcome any trouble that may arise from this source, he will have accomplished the most important part of his task.

METHOD OF CONNECTING A HEADER TO A BATTERY OF BOILERS:—Where two or more boilers are connected to a single header, the use of a reliable Non-return Boiler Stop Valve is necessary, and in some countries their installation is compulsory.

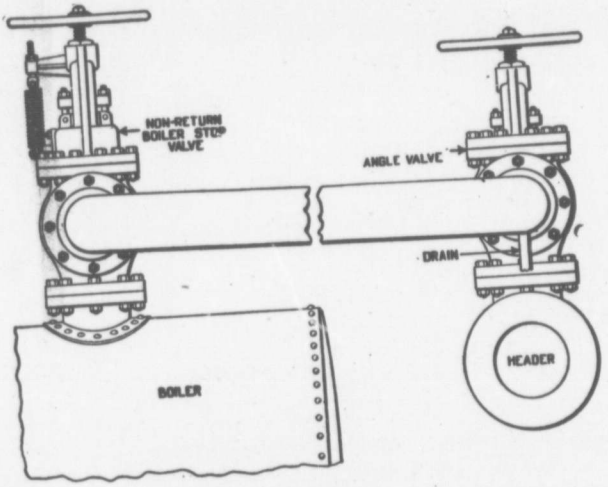


Fig. 13.

A Non-return Boiler Stop Valve will instantly close should the pressure in the boiler to which it is attached suddenly decrease below that in the header, and thereby prevent the entrance of steam from the other boilers in the battery. This sudden decrease in pressure may be caused by a ruptured fitting or the blowing out of a tube, in which event an ordinary stop

valve taking the place of a Non-return Boiler Stop Valve would be inadequate, as the loss of steam from the other boilers of the battery would be tremendous before an ordinary valve could be reached and closed, assuming that it would be possible to do so, which in the majority of cases it is not.

Should it be desired to cut out a boiler for the cleaning or repairs, the Non-return Boiler Stop Valve will not permit steam to enter the boiler from the header, even should the handwheel be operated for this pupose, as it cannot be opened by hand, but can, however, be closed.

The proper method of attaching a header to a battery of boilers is illustrated in Fig. 13. A Non-return Boiler Stop Valve should be attached to each boiler and connected to an angle valve on the header. A pipe bend should be used for connecting the valves as this will allow for expansion

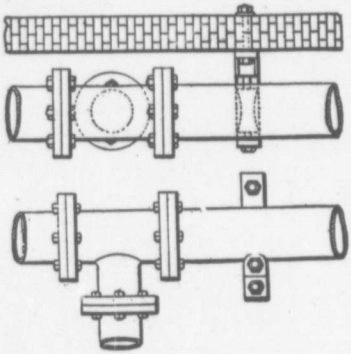


Fig. 14.

and contraction. The pipe should slope a trifle downward toward the header and a suitable drain provided. This drain should be opened and all water permitted to escape before the angle valve is opened, thereby preventing any damage due to water-hammer.

METHOD OF PREVENTING VIBRATION AND SUPPORTING PIPES:—Fig. 14 shows a main header carried on suitable frames fitted with adjustable rollers.

While we have illustrated the pipe as resting on the adjustable rollers, nevertheless the rollers may also be placed at the sides or on top of the pipe to prevent vibration, or in cases where the thrust from a horizontal or vertical branch has to be provided for.

This arrangement will take care of the vibration without in any way preventing the free expansion and contraction of the pipe.

CORRECT METHOD OF PIPING:—Figs. 14 and 15 show a simple arrangement in which the valves have been properly placed, and the pipe arranged with due regard to drainage and expansion.

It will be noticed that should the boiler valve leak slightly, any steam which may condense in the pipes will at once be carried to the separator, and that expansion and contraction will readily

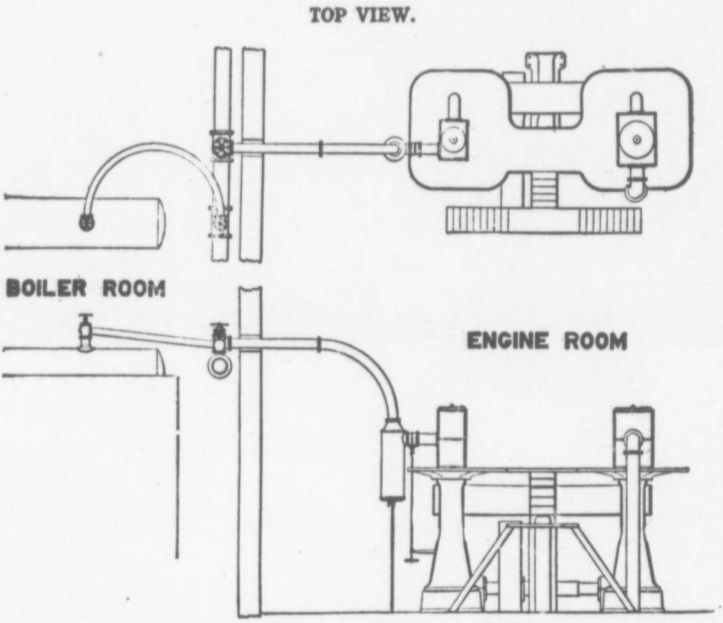


Fig. 15.

be taken up by the pipe bends. A good rule to follow in piping from the boiler to engine, is to arrange the stop valve so that all condensation between it and the boiler will flow back to the boiler, and to slope the piping beyond the valve so that water will drain away from boiler toward the engine. There will then be no contrary currents in the pipe.

Chairman,—

I am sure we are all very pleased with Mr. Wilkinson's explanation on the subjest of "Stop Valves" and I am quite

sure that he knows his business well enough to answer any questions that may be put to him.

Mr. Bly,—

I would like to ask Mr. Wilkinson which he has found best in practice, metal seat or vulcanized rubber seat to give best service under ordinary steam conditions.

Mr. Wilkinson,—

That is a point I do not like to go into very much for various reasons.

I tried to make it clear in my paper that the harder the metal seats are the longer they will wear, it therefore goes with out saying that it is impossible to get rubber composition discs that are very hard, especially if you subject them to high temperatures. Any rubber will vulcanize at 300 degrees heat which is slightly over 100 pounds pressure.

I should like to ask you a question Mr. Bly. Why should you use a vulcanized rubber seat?

Mr. Bly,—

They seem to be cheaper and more easily renewed.

My object has been, in plants I have been connected with, to get every valve as near uniform construction as possible, that is the same make, so that you have not got to get half a dozen different kinds of valve discs.

When I went to where I am at present I found about $50.00 of valve discs that ascended all the way from 1-4 in. Fairbanks to 6 in. Jenkins, so that you can see what an immense amount of various kinds of stock it would be necessary to carry. There is a large quanity of this material on the shelves yet and it seems to me very ridiculous to have four or five different kinds of valves in one plant.

I might say that I have been renewing valve seats of vulcanized rubber and putting in metal discs already made or had them made specially. I found for the first year or two that the rubber valve seats stood pretty well but as they gave out I endeavoured to replace them with metal discs.

Mr. Stainton,—

I have found composition discs very satisfactory. I have found that they stand expansion much better. The trouble with the metal discs I have found is that they spring the bridge out.

Mr. Wilkinson,—

That m'ght happen with the old style valves. The man who could make them the cheapest got the business.

Mr. Taylor,—

We have listened to a good discussion here to-night and as I have had a little experience installing plants I believe that composition discs are not to be relied upon.

One plant in my mind being fitted with valves containing composition discs where steam pressure was 150 pounds did not last only a few days as the valve seats crumbled to pieces with the result that the whole thing was rejected.

In regard to valves not being packed or tested before leaving the manufacturers hands might say that this is serious. As the workman who installs pipe lines and fittings has enough trouble putting them in without having to answer for the valve man's carelessness therefore if they are not packed do not receive them as it is proof they have never been tested.

Mr. Bly,—

It has always appeared to me that our valves are constructed the wrong side up, or rather the wrong side down. The steam pressure tends to push the valve open when closed and it seems to me that some of our manufacturers should try to design a valve whereby when it is closed the steam will hold the seat in its place and not push it open.

There is one thing I would like to call your attention to, which will give you greater efficiency in your valves. Invariably steam fitters will insist on putting the red lead or whatever composition they may be using on the inside of the coupling of the valve instead of on the end of the pipe, with the result that pieces of this lead get in the valve and under the seat, consequently when the valve is closed down it comes on to this material and naturally when the valve does not close properly you have a leaky valve. I have asked them why they do it and the only reason seems to be that they get their hands dirty when they put it on the end of the pipe.

In houses where small piping is used, it has been observed that the red lead practically covers the end of the pipe thereby choking the pipe up to a certain extent and naturally interferes with the flow of the gas or whatever may be going through the pipe.

Mr. Baldwin,—

I know there are a number of you want to get away to go on to the banquet, and I would therefore move that a hearty

vote of thanks be tendered to Mr. Wilkinson for the splendid paper he has given us to-night.

My experience has been that if you want a good valve you have got to pay the money for it.

Mr. Rawstron,—

I second the motion. Carried.

Chairman,—

It has been regularly moved and seconded that a heary vote of thanks be tendered to Mr. Wilkinson for the very able manner in which he has presented this subject to us to-night. What is you pleasure? Carried.

Mr. Wilkinson,—

I hope you have all enjoyed the paper as much as I have the delivering of it and I hope that I have said something that has interested you and will help you in dealing with this matter.

Moved by Mr. Taylor, seconded by Mr. Stainton that the meeting be adjourned. Carried.