W. A. HOWLAND.

CONTROLLER FOR AUTOMATIC VACUUM BREAKERS.

APPLICATION FILED APR. 14, 1921.

1,422,444.

Patented July 11, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

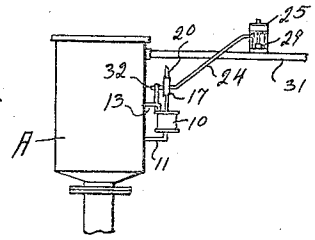

Fig. 2.

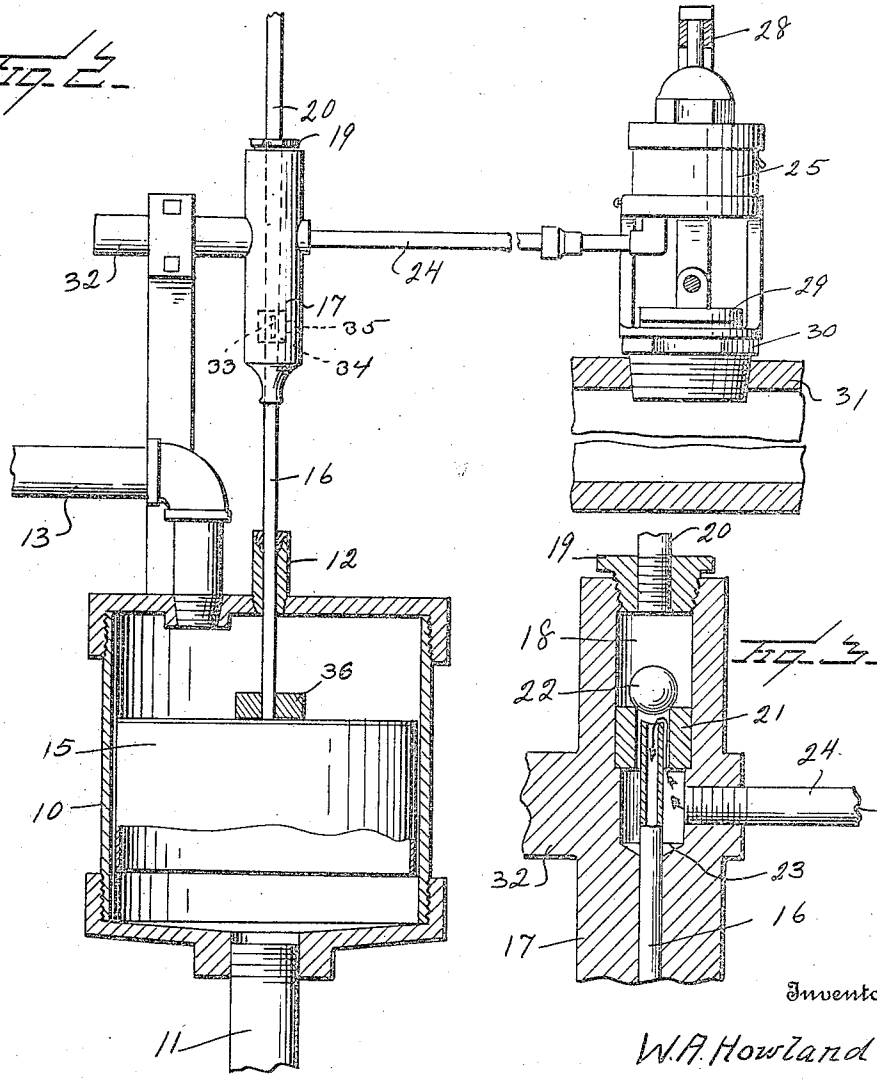

Fig. 4.

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2 SHEETS—SHEET 2.

Fig. 4.

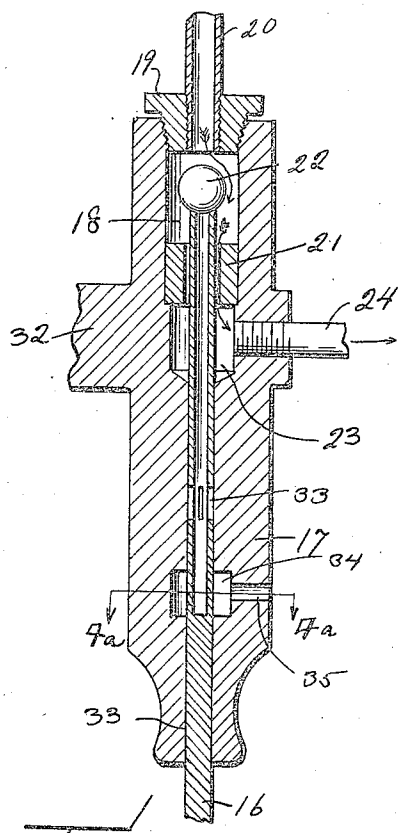


Fig. 4a.

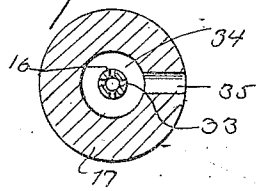
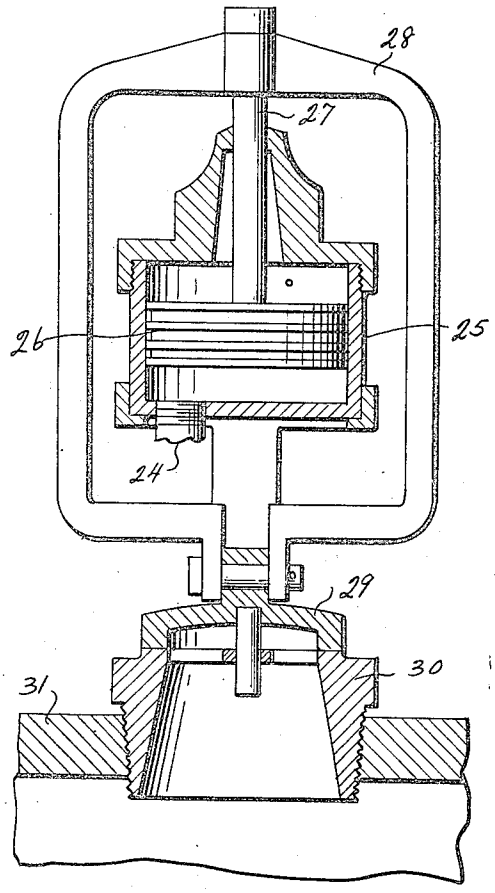


Fig. 5.



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UNITED STATES PATENT OFFICE.

WALDO A. HOWLAND, OF ADAMS, MASSACHUSETTS.

CONTROLLER FOR AUTOMATIC VACUUM BREAKERS.

1,422,444. Specification of Letters Patent. Patented July 11, 1922.

Application filed April 14, 1921. Serial No. 461,359.

To all whom it may concern:

Be it known that I, WALDO A. HOWLAND, a citizen of the United States, residing at Adams, in the county of Berkshire and State of Massachusetts, have invented certain new and Useful Improvements in Controllers for Automatic Vacuum Breakers, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates generally to means for breaking the vacuum in steam plants, and particularly to certain improvements in the controller used for operating the vacuum valve illustrated in my application for patent filed April 10, 1920, Serial No. 372,818.

In the application above referred to, there is illustrated a vacuum valve which is operated by means of a piston, this piston in turn being operated by the inlet of water to the piston chamber, the inlet of water being in turn controlled by a float operated water inlet controlling valve.

The object of the present invention is to improve upon the construction illustrated in my prior application above referred to by the provision of means whereby steam may be admitted to the piston chamber to cause the lifting of the vacuum valve and the consequent breaking of the vacuum in the exhaust pipe of the engine.

And a further object is to provide a construction of this character which is of very simple construction, which is positive in its action, and which, because of its simplicity, will last for an indefinite period when once installed.

Another object is to provide a construction of this character wherein the float operated stem controlling the inlet valve is tubular and constitutes also an exhaust pipe or passage, and in which it is so constructed that when the stem is raised to lift the inlet valve, the port at the end of the tubular stem is automatically closed, but that when the stem is lowered after the breaking of the vacuum and the inlet valve is lowered to its seat, this tubular stem or rod acts as an exhaust pipe.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is an elevation of a condenser and exhaust pipe of a steam engine with my vacuum valve applied thereto;

Figure 2 is a sectional view of the float chamber, the controlling valve being in elevation, the exhaust pipe being in section, and the vacuum valve and its motor being in elevation;

Figure 3 is an enlarged sectional view of the controlling valve casing showing the controlling valve closed;

Figure 4 is a sectional view of the controlling valve casing showing the controlling valve open;

Figure 5 is a sectional view of the motor and the vacuum valve;

Figure 4ª is a section on the line 4ª—4ª of Figure 4, but showing the valve rod depressed and exhausting;

Referring to these figures, it will be seen that I have illustrated in general the mechanism which is fully described and illustrated in my prior application for patent above referred to, this mechanism including a cylinder 10 having heads at its opposite ends, the head at the bottom of the cylinder being provided with an opening in its middle which is connected to the condenser or to the exhaust pipe of the engine by means of a pipe 11. The head at the upper end of the cylinder has a guide box 12 at its center and also has a pipe 13 which also extends from the upper portion of the condenser above the water line thereof, the pipe 11 extending into the condenser below the water line thereof. Disposed within the cylinder 10 is a float 15, and extending up through the stuffing box 14 is a tubular float rod or stem 16.

Mounted in any suitable manner above the center of the cylinder 10 is a valve body or casing 17 into which the upper portion of the rod or stem 16 enters. This valve body is hollow to form a chamber 18, the upper end of this chamber being closed by a bushing, head or any other suitable appliance 19, and extending through this head or bushing is an inlet pipe 20 connected to a source of steam. Disposed within the chamber on a suitable seat formed therein is an annular member 21 constituting a valve seat, and resting upon the upper end of this seat is a spherical valve 22 which can move upward in the chamber 18. The central passageway in the seat member 21 is larger in diameter than the stem or rod 16, and this tubular stem or rod extends up into this valve seat member 21, as is illustrated in the drawings, but is disposed normally a distance of about $\frac{3}{16}$" from the ball valve 22. Below this seat 21

the body is formed to provide a circular chamber 23, and from this chamber leads an outlet steam pipe 24 which is connected to a cylinder 25, such as is illustrated in my pending application above referred to.

Disposed in the cylinder 25 is a piston 26, extending from which is a rod 27, in turn connected to a yoke 28 which surrounds the cylinder 25 and which at its lower end is connected to the vacuum breaker valve 29 which rests on a screw-threaded seat 30 formed in the exhaust pipe 31. All these parts may be of any suitable or usual construction and are designed to be of the form illustrated in my prior application.

When steam is admitted to the lower end of the cylinder 25, it will force up the piston 26 and forcibly raise the vacuum valve from its seat, thus breaking the vacuum in the exhaust pipe or allied parts. When, on the contrary, the steam is allowed to exhaust from the chamber 25, the vacuum valve will return to its seat. The body 11 is provided with a supporting arm 32, to which a bracket may be attached for supporting the valve casing 11. The tubular stem 16 is formed at one point with a plurality of elongated exhaust ports 33 so formed that when the stem 16 is raised, the exhaust ports will be closed by the body of the casing 11. When, however, the stem is lowered to its normal position, this exhaust port will open into exhaust chamber 34, as shown in Figure 4ª, having an exhaust opening 35. The chamber 10 is shown as connected to the condenser A just above the normal water level by the pipe 11. The equalizer pipe 13 extends into the condenser about 14″ above the connection 11. It is, of course, understood that the condenser and its pump are always placed as far below the engine cylinder as possible. It will be understood, therefore, that if the water in the condenser rises above a certain amount, due to there being a more intense vacuum in the cylinder than at the condenser, which condition may be caused by the stoppage of the air pump or the stoppage of the circulating pump before the engine is stopped, or because the engine has not given free exhaust to the air, then as soon as the rising water seals the inlet pipe 11 to the chamber 10, the vacuum existing higher up in the condenser at once begins to assist in causing the water to enter the chamber 10 below the float or piston 17 and will, of course, assist in the quick action of the motor valve stem 16. This is important, as it removes any possibility of the float or piston not functioning properly.

The operation of this mechanism is as follows: If for any reason the water in the condenser or exhaust pipe to feed water heater, for instance, begins to rise above its normal height and thus is liable to be drawn into the cylinders of the engine and it is necessary, therefore, to break the vacuum in the exhaust pipe, then this water enters the chamber 10, and if the water therein rises from 1½″ to 2″, for instance, the float 17 rises and the stem 16 pushes the spherical valve 24 from its seat on member 21. This permits steam from the pipe 20 to pass downward around the spherical valve and around the upper end of the stem 16 and into the chamber 23 and from thence by pipe 24 to the lower end of the cylinder 25. The upward movement of the piston 26 causes the lifting of the vacuum breaking valve and the valve 29 remains suspended until the level of the water in the receptacle to which the chamber 10 is connected lowers or returns to its normal level. This return of the water causes the downward movement of the tubular stem 16, which permits the valve 24 to lower onto the seat 21, thus cutting off the supply of steam. The downward movement of the tubular stem opens the exhaust port 33, whereupon the steam contained within the cylinder 25 is exhausted back through the pipe 24 into the chamber 23 up around the upper end of the tubular stem and downward through this stem and out through the port 33. The upper end of the tubular stem or rod 16 is slightly cut out or concave so that the spherical valve will be more perfectly seated in the upper end of the tubular stem so as to prevent any possible leakage of air, steam or other motive fluid.

When in normal position, the exhaust ports align with the chamber 34 in the valve body, but when this motor or controlling valve is in action and the stem raised, this port is disposed entirely inside of the valve body. Thus the valve 24 which rests on the upper end of the stem seals that end and the lower outlet end of the stem is sealed by the valve body itself. There is, therefore, no possible chance of connection being formed with the outside air and there is no possible leakage. The amount of lift is adjusted by using different length thimbles 36 slipped on over the rod 16 in the process of assembling, these thimbles resting upon the upper head of the float 15 and limiting the upward movement of the float. In practice there is about $\frac{3}{16}$″ space in normal position between the top of the upper end of the stem 16 and the under side of the valve 22. This space allows for all of the steam to escape and likewise permits of a slight knock or blow being given to the valve when the float rises to thus cause the full detachment of the valve from its seat and rendering the lift easier for the float.

Attention is also called to the fact that because the valve 22 is spherical in form it tends to shift to different positions upon its seat so that in effect the spherical valve and the seat are ground by contact with each

other, thus securing a perfect seating of the valve.

I do not wish to be limited to the particular construction of the float and float chamber connected to the valve stem 16, nor to the particular construction of the breaker valve, nor its float and float chamber, nor to the details of construction of the motor or controlling valve which forms the subject matter of this present application, as these parts may be changed in many ways without departing from the spirit of the invention as stated in the appended claims.

It is to be particularly noted that the exhaust ports 33 are drawn up and entirely housed within the casing 17 before the valve 22 starts to leave its seat, and that the exhaust ports are so housed or closed until such time as the steam valve has returned to its valve seat. Thus there is no chance for the steam or other motor fluid coming from pipe 20 to exhaust through the ports 33 when the valve 22 is raised and the exhaust from the cylinder 25 is not permitted until the valve 22 has closed.

It is also to be noted that by forming a plurality of radially extending exhaust ports 33 in the stem 16 that this stem may rotate and yet the exhaust ports will always be in position to discharge freely through the circular chamber 34, through which the stem passes. I do not wish to be limited to the exact construction illustrated, however, as it is obvious that these exhaust ports need not be at this particular portion of the stem and that no exhaust chamber proper need be necessarily used.

I claim:—

1. In a mechanism of the character described, a controlling valve comprising a hollow valve body formed with an annular seat, a valve normally resting on said seat, an inlet pipe entering the valve body above the seat and valve, an outlet pipe below the seat, and a tubular stem entering the opposite end of the valve body from the inlet pipe and having a diameter smaller than the diameter of the aperture in the annular seat, said stem having that end adjacent the valve open and having an outlet port in its length, the stem when shifted in one direction lifting the valve from its seat and permitting fluid to pass from the inlet pipe to the outlet pipe, said stem when lowered permitting the return of the valve to its seat and constituting an exhaust pipe.

2. A mechanism of the character described including a valve body having an annular seat therein, the valve body having a fluid inlet above the seat and a fluid outlet below the seat, a valve resting on said seat, and a tubular stem entering the valve body at the end remote from the inlet and having a diameter smaller than the aperture through the seat, the stem being open at its end adjacent the valve and formed with an outlet port in its length and separated from the valve end of the stem by a distance less than the length of the valve body from said seat to the outlet.

3. In a mechanism of the character described, a vacuum breaking valve, fluid operated means for opening said valve, means for controlling the admission of fluid to the fluid operated means comprising a hollow body having an annular seat, a fluid inlet above said seat, a fluid outlet below the seat and extending to the fluid operated mechanism of the vacuum valve, a valve normally resting upon said seat, a float, a tubular stem carried by the float and movable therewith and extending upward through the valve body with its upper end in position adjacent the valve, said stem being less in diameter than the aperture in the seat and being tubular and having an open upper end adjacent the valve and being formed with an exhaust port in its length beyond the valve body whereby as said float rises the stem will lift the valve from its seat and permit the passage of motive fluid to the fluid operated mechanism of the vacuum valve and when the float lowers the stem will return to its seat and act as a conductor.

4. A controlling means for a mechanism of the character described comprising a hollow valve body, an annular seat intermediate the ends of the valve body, a fluid inlet pipe entering the upper end of the valve body, an outlet pipe extending from the valve body and below the seat, a spherical valve resting by gravity upon the seat, a float, a hollow stem entering the lower end of the valve body and extending upward into the aperture of the seat, said stem being open at its upper end adjacent the valve and having a port in its length normally communicating with the exterior of the valve body, said port being closed by the valve body upon an upward movement of the stem.

In testimony whereof I hereunto affix my signature.

WALDO A. HOWLAND.