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DEVICE FOR AUTOMATICALLY MAINTAINING THE WATER IN BOILERS AT A CERTAIN LEVEL.

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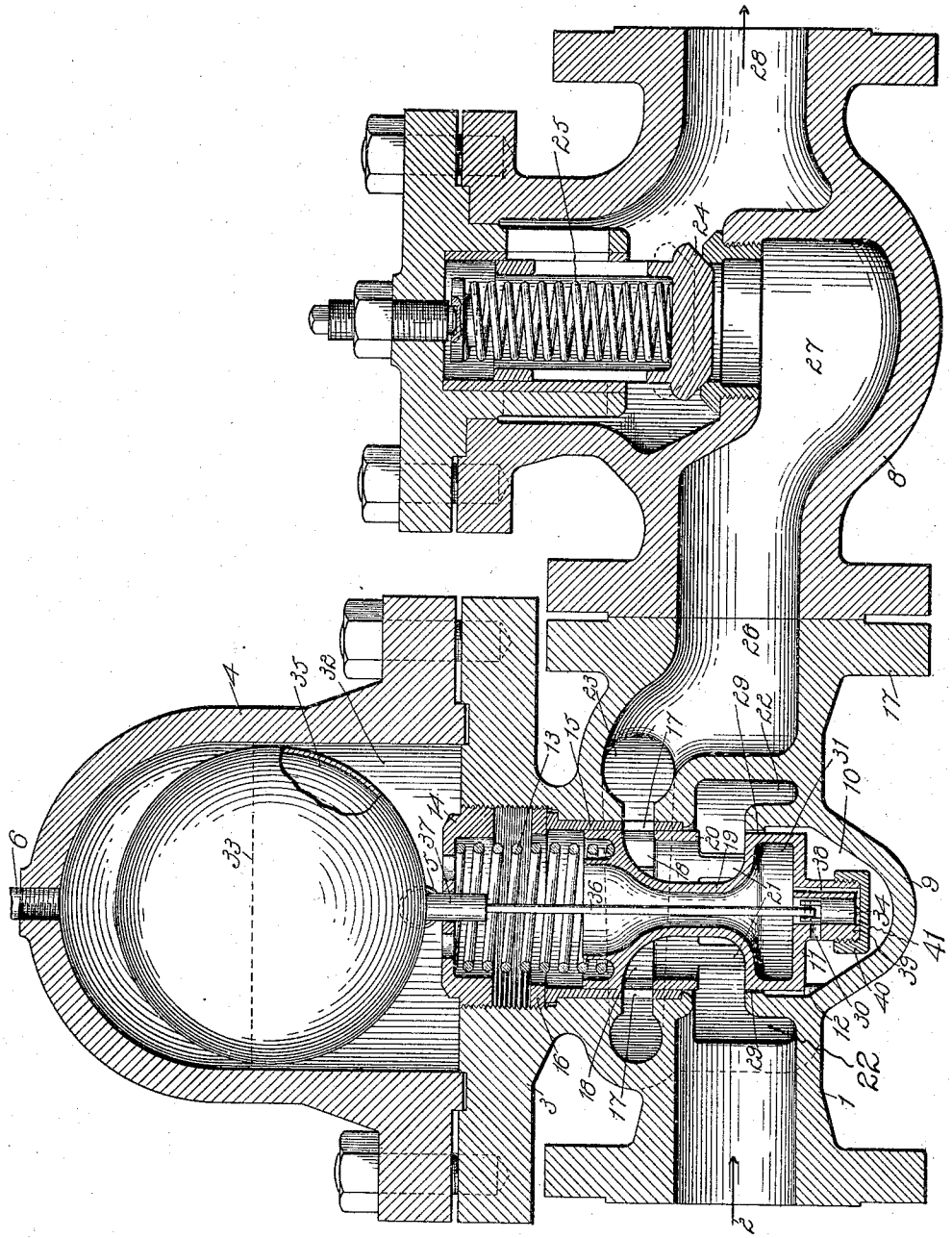

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UNITED STATES PATENT OFFICE.

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DEVICE FOR AUTOMATICALLY MAINTAINING THE WATER IN BOILERS AT A CERTAIN LEVEL.

1,191,963. Specification of Letters Patent. Patented July 25, 1916.

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To all whom it may concern:

Be it known that I, GUSTAF A. GUSTAFSON, a subject of the King of Sweden, residing at Harvey, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Devices for Automatically Maintaining the Water in Boilers at a Certain Level, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to devices for automatically maintaining the water in boilers at a certain level.

My invention contemplates an arrangement whereby the water is forced into the boiler at a certain pressure above the pressure of the water in the boiler. The water is forced through suitable valve mechanism which is so arranged as to automatically shut off the water when the water in the boiler has reached a certain level, and in addition, this mechanism serves to admit more water to the boiler when the water level has become lowered beyond a pre-determined point.

My invention will be better understood by referring to the accompanying drawing which illustrates in cross-section the mechanism forming the subject of my invention.

Referring to the drawing it will be noted that a casing 1, is provided which has a suitable flange for connection to suitable piping so as to afford an inlet for the water to the boiler, this water flowing in the direction of the arrow 2, as shown. The casing is provided at its upper portion with an enlarged portion 3, which is arranged to support a dome 4, this dome having suitable connection to the boiler by means of a pipe 5. At the top of the dome a pipe 6, is screw-threaded into the dome and may be connected with the boiler. The casing 1, is provided with a flange 17, which affords means of attachment to a suitable check valve 8, which is interposed between the boiler and the casing 1. The casing 1, is provided with a portion 9, which forms a compartment 10 and a valve member 11 is arranged for vertical movement and is normally held in a down position against a stop 12 by means of a spring 13, which bears against the top of the valve member 11 and against a sleeve 14 screw-threaded into the portion 3 as shown. The valve member is arranged to have bearing engagement with a sleeve 15 which is held in position by means of a member 16 which is screw-threaded into the casing. The sleeve 15 is provided with a plurality of connecting members 17 between which there are suitable openings 18, as shown. The valve member 11 is provided with a diminished portion 19 and with an annular intermediate portion 20, this portion being connected with the main part of the valve by means of ribs 21.

The casing 1 is arranged to have an enlarged opening 22, and an enlarged opening 23 which are in communication when the valve member is in its normal down position, as shown. The water which is forced into the opening 22, is at a greater pressure than the water in the boiler. This pressure is obtained by means of the check valve 8, which is arranged so that its operation is effected only when the water is forced in at a greater pressure than that in the boiler, and which has a valve member 24, which is held upon its seat by means of a suitable spring 25, which is arranged so as to be given different degrees of tension in accordance with requirements, this tension being supplied by means of a screw which is threaded into the check valve casing as shown. It is desirable to use a check in order that sufficient pressure of the water may be obtained in order to operate the valve member 11, that is, the valve member depends upon the check for its operation. It may be well to state that the check valve which is employed in conjunction with my invention may be of any desirable construction, and instead of being separate as shown, may be disposed in the casing 1. Assuming that the water is now flowing into the boiler it will be forced into the opening 22, and through the openings between the ribs 21 of the valve member 11, and up through the openings 18 in the sleeve 15, and into the enlarged opening 23, when it will flow through the outlet 26 of the casing 1, and into the opening 27 of the check valve, thus forcing the valve member 24 into the position as shown in dotted lines, so that the water will be forced into the boiler through the outlet 28 of the check valve.

As this water is flowing into the boiler a part of it also flows through the opening at 29 for the reason that the valve member 11 has a loose fit with the casing 1 at this particular portion so that part of the water flows down into the compartment 10, and through an opening 30 and up into the compartment 31. As a result of the loose fit of the valve member 11 in the valve casing when the water in the boiler is below the level required to actuate the valve 34, the water flowing through the clearance opening 29 and the port 30 establishes a pressure inside of the valve member 11 practically equal to the pressure of the water flowing through the valve member 20, and there is therefore no tendency on the part of the pressure of the water flowing through the valve member 20 to raise the valve 11 against the action of the spring 13. As the water in the boiler rises the water will also rise in the compartment 31 and when the water in the boiler has reached a level such that it can flow into the compartment 32 formed by the dome 4, the water level will reach a point as shown by the dotted line 33, whereupon the pilot valve 34 will be actuated, owing to its connection with the float 35 by means of a spindle 36. This spindle has an enlargement at 37 which bears in an opening provided in the member 14. It is to be understood of course, that the greater portion of the water flows into the compartment 32 through the pipe 5 leading to the boiler. The valve member 11, has a channel 38 which leads from the compartment 31 and down through the neck portion 39. This channel 38 is closed at the bottom by means of a nut 40, screw-threaded with the neck portion 39. When the water in the compartment 32, has reached the point as indicated by the line 33, the float 35 will rise whereupon the opening 30, will be closed by the pilot valve 34 and since there is no path offered for the water to flow up into, the compartment 31, the water will build up a pressure underneath the valve member 11, thus causing it to rise, that is to say, both the pilot valve 34 and the valve member 11, will rise simultaneously after the opening 30, has been closed. This will continue until the annular portion 20 of the valve member has closed the openings 18 so as to shut off communication between the openings 22 and 23, whereupon the valve member 24 of the check valve will be seated owing to the fact that no water is forced against this valve member. As long as the water in the boiler remains at the level indicated the valve member will close communication to the boiler and it will be seen that this valve member is balanced, that is to say, water is on both sides thereof. When the water in the boiler has been lowered to a position where more is needed, the float 35 will become lowered slightly so that the opening 30 is uncovered by the pilot valve 34, thus allowing the valve member 11 to be forced downward by means of the spring 13. This downward movement will continue until the valve member is in a position as shown in the drawing. It will be understood of course, that when the pilot valve is lowered that the water which has accumulated in pocket 41 will be forced out through the channel 38 into the compartment 31.

As a result of the construction described above, it will be seen that besides having definite open and closed positions the valve 11 has intermediate positions of control for any level of the water in the boiler between that required to fully open the valve 11 and that required to fully close it; for, assuming that the water level in the boiler is maintained for a time at substantially half way between these two limiting controlling levels, the valve 34 remains practically stationary during that interval, and the valve 11 is maintained in a position substantially half closing the ports of the valve for the following reasons: When the valve 34 was raised from its lowest position indicated in the drawings to the position represented by the intermediate water level referred to, the water pressure built up in the compartment 10 served to raise the valve 11 until the port 30 was again opened, from which time, as a result of the equalization of the pressure in the inside of the valve member 11, as above described, with the pressure of the water flowing through the valve member 20, a condition of equilibrium is established by which the valve 11 is held in its substantially half closed position, for if it should drop from this position somewhat, water pressure would again be built up in the compartment 10 to again raise the valve 11 to its mid-position, and, therefore, for any slight fluctuations of the valve 34 from its mid-position the valve member 11 moves a corresponding amount either up or down to establish a new condition of equilibrium. From this it will appear that the control exercised by the valve 11 and its pilot valve 34 is determined by the relation of these valves to each other and not by any fixed position vertically of either the valve 11 or the pilot valve 34.

As before stated, the pipe 6 at the top of the dome 4 is connected with the boiler so that the pressure from the boiler will act upon the float 33 so as to force it to its down position when there is not sufficient water in the compartment 32.

While I have herein shown and described the specific embodiments of my invention, I do not wish to be limited to the precise arrangement shown as it will be apparent to those skilled in the art that modifications may be made without departing from the spirit and scope of my invention.

What I claim is:

1. In a device of the class described, the combination of a casing having an inlet and an outlet opening and having a loop-shaped port, a hollow cylindrical valve having two cut-offs, a guide below said loop-shaped port for said valve, one of said cut-offs being for the outlet opening and the other controlling communication between the inside and the outside of the valve, said valve having a portion coöperating with the inlet opening to reduce the cross section of inlet communication when the valve is operated, and a chamber in said casing below said guide for containing water under pressure to operate said valve.

2. In a device of the class described, the combination of a casing having an inlet and an outlet opening and having a loop-shaped port, a hollow cylindrical valve having two cut-offs, a guide below said loop-shaped port for said valve, one of said cut-offs being for the outlet opening and the other controlling communication between the inside and the outside of the valve, said valve having a portion coöperating with said inlet opening to reduce the cross section of inlet communication when said valve is operated, a chamber in said casing below said guide for containing water under pressure to operate said valve, a spring engaging said valve tending to hold said valve in open position, and devices for changing the tension of said spring.

3. In a device of the class described, the combination of a casing containing inlet and outlet ports, a hollow valve member constituting a cut-off for one of said ports, and having another portion for changing the effective size of another of said ports, a loosely fitting guide for said member below the lower port, an operating chamber in said casing below said guide and around the lower end of said member, and a pilot valve in the lower end of said member to control communication between said chamber and the interior of said member.

4. In a device of the class described, the combination of a casing containing inlet and outlet ports, a hollow valve member constituting a cut-off for one of said ports, and having another portion for changing the effective size of another of said ports, a loosely fitting guide for said member below the lower port, an operating chamber in said casing below said guide and around the lower end of said member, a pilot valve in the lower end of said member to control communication between said chamber and the interior of said member, a float chamber for connection with a boiler to be fed, a float in said chamber, and an operating rod extending from said float through said hollow member to said pilot valve.

5. In a device of the class described, the combination of a casing containing inlet and outlet ports, a hollow valve member constituting a cut-off for one of said ports, and having another portion for changing the effective size of another of said ports, a loosely fitting guide for said member below the lower port, an operating chamber in said casing below said guide and around the lower end of said member, a pilot valve in the lower end of said member to control communication between said chamber and the interior of said member, and mechanism for maintaining the water pressure in said ports a desired amount in excess of the pressure in said hollow valve member.

6. In a device of the class described, the combination of a casing containing inlet and outlet ports, a hollow valve member constituting a cut-off for one of said ports, and having another portion for changing the effective size of another of said ports, a loosely fitting guide for said member below the lower port, an operating chamber in said casing below said guide and around the lower end of said member, a pilot valve in the lower end of said member to control communication between said chamber and the interior of said member, a float chamber for connection with a boiler to be fed, a float in said chamber, an operating rod extending from said float through said hollow member to said pilot valve, and mechanism for maintaining the water pressure in said ports a desired amount in excess of the pressure in said hollow valve member and float chamber.

In witness whereof, I hereunto subscribe my name this 25th day of January, A. D., 1913.

GUSTAF A. GUSTAFSON.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."