J. J. BURKE.

AUTOMATIC BOILER FEED AND WATER LEVEL ALARM.

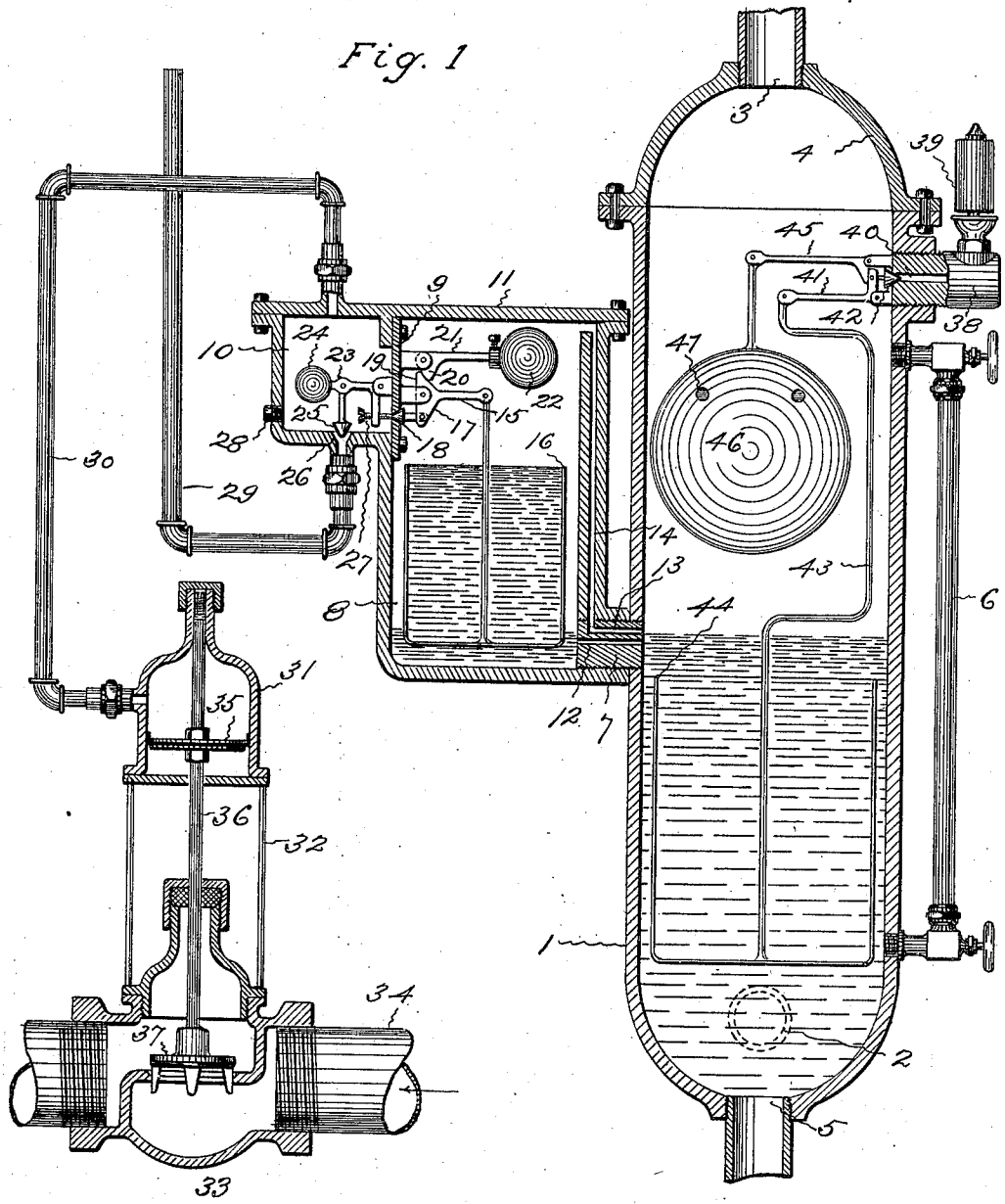
APPLICATION FILED MAR. 8, 1910.

1,002,219.

Patented Sept. 5, 1911.

2 SHEETS—SHEET 1.

Fig. 1



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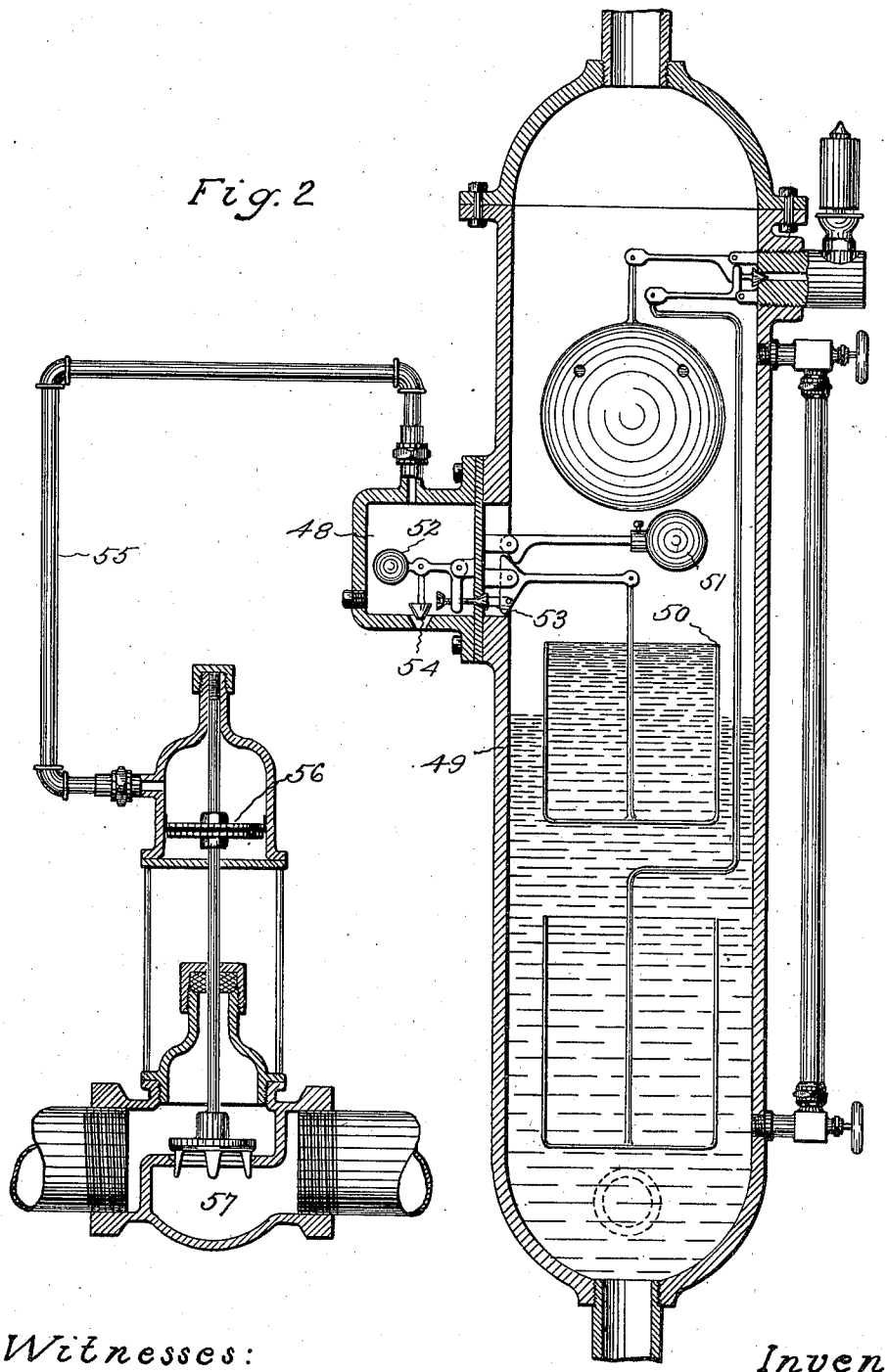
2 SHEETS—SHEET 2.

Fig. 2



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UNITED STATES PATENT OFFICE.

JAMES J. BURKE, OF HARTFORD, CONNECTICUT.

AUTOMATIC BOILER-FEED AND WATER-LEVEL ALARM.

1,002,219. Specification of Letters Patent. Patented Sept. 5, 1911.

Application filed March 8, 1910. Serial No. 548,086.

To all whom it may concern:

Be it known that I, JAMES J. BURKE, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented a new and useful Improvement in Automatic Boiler-Feeds and Water-Level Alarms, of which the following is a specification.

This invention relates to those apparatus which are designed to be applied to steam boilers for the purpose of automatically controlling the valves in the water feed pipes, in such manner that the level of the water in the boilers will remain practically constant, or an alarm will be sounded.

The object of this invention is to provide a comparatively simple, sensitive and durable, automatic feed-water-regulator for a boiler, which will surely keep the water in the boiler at, or very nearly at, the same level without any attention from the engineer or fireman, and which will sound an alarm, if for any reason, the regulator should fail to perform its work and the water should either rise above or fall below the proper level, an excessive amount.

Figure 1 of the accompanying drawings shows a vertical section of an apparatus which embodies the invention, with the water level regulating bucket arranged in an auxiliary chamber. Fig. 2 is a vertical section with the regulating bucket arranged in the main water column.

The tank or water column 1 is designed to be connected at 2 with the boiler below the water line, and at 3 with the boiler above the water line, so that the level of the water in the column will, at all times, be the same as the level of the water in the boiler. The column has a cap 4, which is fastened to the top by bolts in such manner that it can be removed, when necessary, for arranging the buckets and other mechanism therein, and the column is desirably provided with a blow-off opening 5 at the bottom, so that it may be emptied. A glass water gage 6 is connected with one side of the column in the usual manner so that the height of the water in the boiler and column can be observed at any time. Connected to the column, on one side at about the desired water level, by a nipple 7, is the regulating bucket chamber 8. At one side of this chamber, and separated therefrom, by a partition plate 9, is the exhaust valve chamber 10. A plate 11 bolted to the top covers these two chambers. The nipple 7 has an opening 12 that connects the column, at about the water level, with the bucket chamber, near the bottom, and a little higher it has an opening 13 that connects the column, near the desired water level, with a passage 14 which leads to the top of the bucket chamber. A T-shaped lever 15 is pivoted between ears that project into the bucket chamber from the partition plate 9. A bucket 16 is hung from the long arm of this lever. The lower short arm 17 of this lever is connected with a valve 18 that is arranged to open and close a port in the partition between the regulating bucket chamber and the exhaust valve chamber. The upper short arm 19 of this lever is engaged by the short arm 20 of an angle lever 21 which is pivoted to ears projecting from the partition, and which, on its long arm, has a weight 22 that is designed to partly counterbalance the bucket and the water which it holds.

In the exhaust valve chamber is an angle lever 23, that is pivoted to ears which project from the partition. On the outer end of this lever is a weight 24, and connected with the long arm between the fulcrum and weight is a valve 25 designed to open and close the exhaust outlet 26. The short arm of this lever carries a screw 27 which engages the stem of the valve 18, in such manner that the weight 24 also partly counterbalances the regulating bucket and water. The screw may be adjusted by a screw driver when the plug 28 is removed from the side of the chamber. The exhaust outlet communicates with a stand pipe 29 that is open to the atmosphere or that may connect with a drain. A pipe 30 connects the top of the exhaust valve chamber with a cylinder 31. This cylinder is shown as supported on rods 32 above the feed water throttle valve 33 that is in the line of feed-water pipe 34 that runs from the feed pump to the boiler. The piston 35 in the cylinder is connected with the stem 36 of the valve disk 37, which is designed to open and close the port in the feed water valve.

When the water in the boiler is below the desired level, and the feed pump is working, as long as the water level is below the passage 13, the water will stand at the same height in both the column 1 and the bucket chamber 8. With the water at this height,

the weight of the water filled regulating bucket 16 will be sufficient to counterbalance the weights 22 and 24 and keep the valve 18 closed and the exhaust valve 25 open. With the valves in this condition, there is no pressure in the chamber 10, pipe 30 and cylinder 31, and the piston is free to rise and allow the feed water, which is being pumped, to open the feed valve, and flow into the boiler. When the water in the column rises high enough to close the passage 13, so that steam cannot enter the regulating bucket chamber from the column, the steam in the chamber will condense and relieve the pressure therein, allowing water to flow in. As the water rises in the chamber around the bucket, its effective weight is reduced, and when the water has risen sufficiently high the counterbalance weights 22 and 24 will act to open the valve 18 and close the exhaust valve 25. The pressure in the bucket chamber will then be transmitted to the chamber 10, and through the pipe 30 to the cylinder, where it will force down the piston and close the feed valve, thus preventing any more water from flowing to the boiler. When the water level again falls below the passage 13, steam will enter the top of the bucket chamber and drive the water out through the passage 12 until the water level is the same as in the column. The weight of the water filled bucket 16 will now counteract the weights 22 and 24 and close the valve 18 and open the exhaust valve 25. As the pressure is now exhausted from the cylinder, the pressure of the water from the feed pump will again open the valve and water will pass to the boiler.

The water column may be dispensed with if desired, and the chamber 8 may be connected directly with the boiler at the desired water level. A plug 38 is screwed into the side of the column near the top. This plug, at its outer end, carries a whistle 39 which is connected with the column by a passage 40. Pivoted to ears which project from the plug is an angle lever 41. Connected with the short arm of this lever is a valve 42, which is adapted to open and close the passage to the whistle. Attached to the long arm of this lever, by a rod 43, is an open bucket 44 in the lower part of the column, below the desired water level. An angle lever 45 is also pivoted to ears extending from the plug. The short arm of this lever engages with the short arm of the lever 41, and the long arm of this lever carries a bucket 46. This latter bucket is made in the shape of a sphere, and is provided with the holes 47 so that it may be partially filled with water.

When the water level is at the proper height, the lower alarm bucket 44 will be completely submerged. The weight of the top bucket and the water therein, will, under these conditions, be sufficient to hold the whistle valve closed. If, however, for any reason, the regulator should fail to operate, and the water level should drop, the lower bucket 44 will be uncovered until its weight and that of the water in it, will be sufficient to counterbalance the weight of the water in the top bucket 46, and pull open the whistle valve so the whistle will sound warning. If the regulator fails to operate when water is being fed to the boiler, the water level will rise until the top bucket 46 is so submerged that the weight of the lower bucket will again be sufficient to pull open the valve 42 and cause the whistle to again give warning that the water feed needs attention. The height of the water in the glass gage will show whether the water is high or low when the whistle blows.

In the form of regulator shown in Fig. 2, the construction of the high and low water alarm is the same as shown in Fig. 1. The feed pipe valve and the cylinder with the valve operating piston are also the same. The auxiliary or regulating bucket chamber however, is omitted. In this form the exhaust valve chamber 48 is bolted directly to the column 49. This allows the water filled regulating bucket 50 to be hung in the column so that the desired water level will be at about its middle. When the water level rises, the counterbalance of the weights 51 and 52 will be sufficient to open the valve 53 and close the exhaust valve 54, thus allowing the steam pressure to enter the chamber 48 and to be transmitted through the pipe 55 to the piston 56 so as to close the valve 57 and stop the flow of feed water to the boiler, as previously explained. When the water level lowers, the weight of the water filled bucket 50 again acts to close the valve 53 and open the exhaust valve 54, and relieve the piston of pressure as before explained.

The invention claimed is:—

1. In a feed water regulator in combination, a water column adapted to be connected with a boiler, at one end below and at the other end above the water line, a regulator bucket adapted to contain water and arranged to be immersed in and to have its effective weight varied according to the level of the water in which it is immersed, said water level depending upon the amount of water in the water column, a lever upon which said bucket is hung, a pressure valve connected with said lever, a weighted lever engaged with said bucket lever and adapted to counterbalance the weight of said bucket, a chamber, a weighted lever in said chamber and engaged with said pressure valve, an exhaust valve connected with said last mentioned lever and adapted to open and close an exhaust outlet from said chamber, a cylinder connected with said chamber, a piston

in said cylinder, a feed water throttle valve, and a connection between the stem of the feed water valve and the piston.

2. In a feed water regulator in combination, a water column adapted to be connected with a boiler, at one end below and at the other end above the water line, a regulator bucket adapted to contain water and arranged to be immersed in and to have its effective weight varied according to the level of the water in which it is immersed, said water level depending upon the amount of water in the water column, a lever upon which said bucket is hung, a pressure valve connected with said lever, a weighted lever engaged with said bucket lever and adapted to counterbalance the weight of said bucket, a chamber, a weighted lever in said chamber, a screw turning in one end of said lever and adapted to butt against said pressure valve, an exhaust valve connected with the last mentioned lever and adapted to open and close an exhaust outlet from said chamber, a cylinder connected with said chamber, a piston in said cylinder, a feed water throttle valve, and a connection between the stem of the feed water valve and the piston.

3. In a feed water regulator in combination, a water column adapted to be connected with a boiler at one end below and at the other end above the water line, a regulator bucket adapted to contain water and arranged to be immersed in and to have its effective weight varied according to the level of the water in which it is immersed, said water level depending upon the amount of water in the water column, a lever upon which said bucket is hung, a pressure valve connected with said lever, a weighted lever engaged with said bucket lever and adapted to counterbalance the weight of said bucket, a chamber, a weighted lever in said chamber engaging with said pressure valve, an exhaust valve connected with the last mentioned lever and adapted to open and close an exhaust outlet from said chamber, a stand pipe connected with said exhaust outlet, a cylinder connected with said chamber, a piston in said cylinder, a feed water throttle valve, and a connection between the stem of the feed water valve and the piston.

4. In a feed water regulator in combination, a water column adapted to be connected with a boiler, at one end below and at the other end above the water line, a chamber having two passages connecting it with the column at about the desired water line, one passage connecting the column with the bottom of the chamber, and the other passage connecting the column with the top of the chamber, a regulator bucket adapted to contain water and arranged to be immersed in water in said chamber, a lever upon which said bucket is hung, a chamber communicating with said regulator bucket chamber, a pressure valve connected with said bucket lever and controlling the passage from one chamber to the other, a weighted lever engaged with said bucket lever and adapted to counterbalance the weight of said bucket, a weighted lever in the exhaust chamber and engaged with said pressure valve, an exhaust valve connected with said last mentioned lever and adapted to open and close an outlet from the exhaust chamber, a cylinder connected with the exhaust chamber, a piston in said cylinder, a feed water throttle valve, and a connection between the stem of the feed water valve and the piston.

5. The combination in a feed water regulator, of a bucket chamber having two inlet passages, one opening near the bottom and the other opening near the top of said chamber, an exhaust chamber communicating with said bucket chamber, a lever pivoted in said bucket chamber, a bucket connected with said lever, a valve connected with said lever and arranged to control the passage between said chambers, a weighted lever adapted to engage the bucket lever and counterbalance the weight of said bucket, a lever in the exhaust chamber, an exhaust valve connected with said last mentioned lever, means carried by said lever and adapted to engage the valve in the passage between said chambers, and a weight carried by the lever in the exhaust chamber and arranged to act with the weight in the bucket chamber in counterbalancing the weight of the bucket.

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