H. K. GOWDY.

BOILER FEED WATER REGULATOR.

APPLICATION FILED MAR. 28, 1910.

1,037,240.

Patented Sept. 3, 1912.

2 SHEETS—SHEET 1.

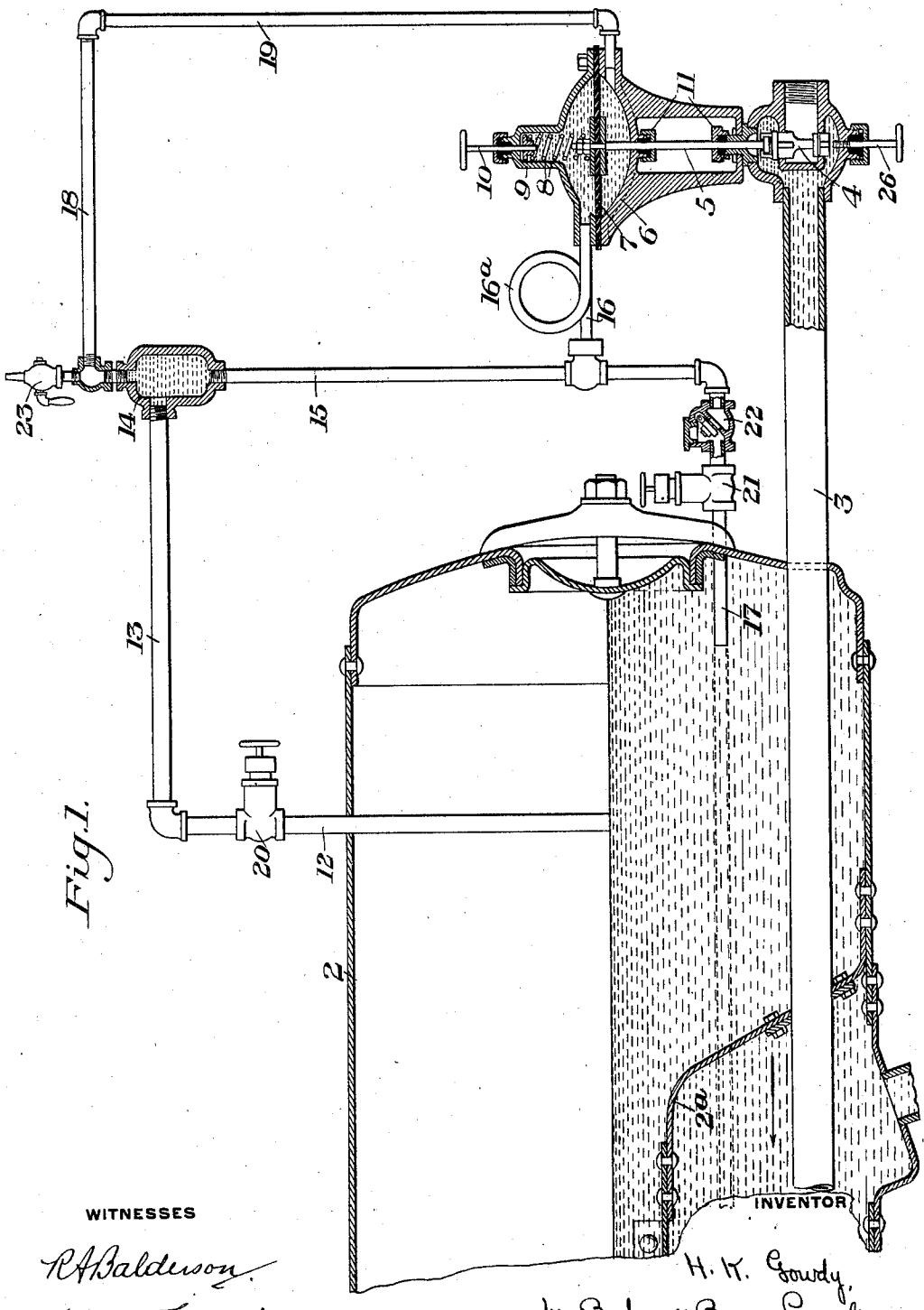

Fig. 1.

WITNESSES

R. A. Balderson

Walter Famariss

INVENTOR

H. K. Gowdy,

by Bakewell, Byrne & Parmelee.

his Attys

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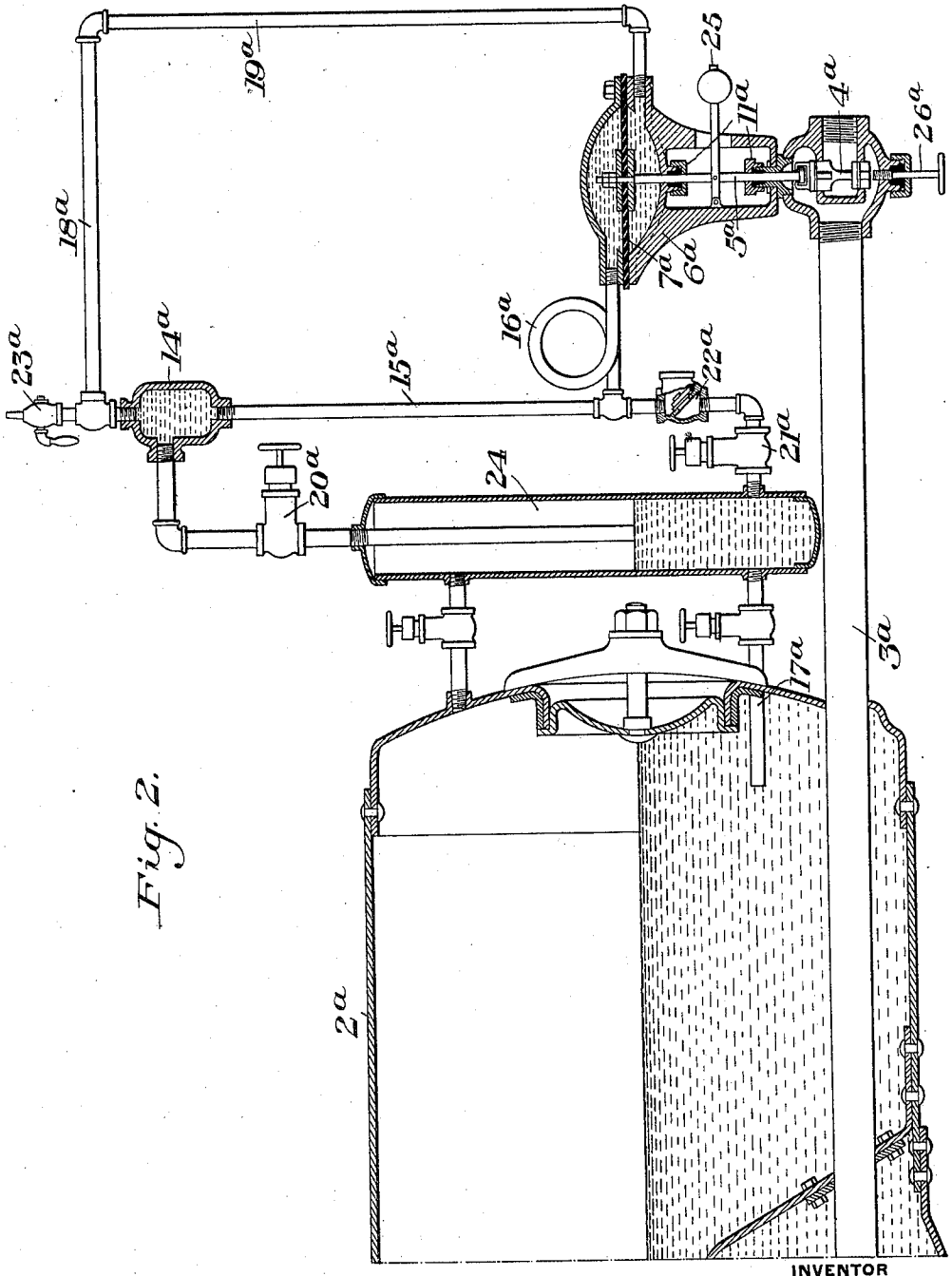

Fig. 2.

WITNESSES

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Walter Famariss

INVENTOR

H. K. Gowdy,

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UNITED STATES PATENT OFFICE.

HAROLD K. GOWDY, OF PITTSBURGH, PENNSYLVANIA.

BOILER FEED-WATER REGULATOR.

1,037,240. Specification of Letters Patent. Patented Sept. 3, 1912.

Application filed March 28, 1910. Serial No. 551,936.

To all whom it may concern:

Be it known that I, HAROLD K. GOWDY, resident of Pittsburgh, Allegheny county, Pennsylvania, have invented a new and useful Boiler Feed-Water Regulator, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figures 1 and 2 are sectional elevations partially diagrammatic, illustrating two different embodiments of my invention.

My invention has relation to boiler feed water regulators, and is designed to provide apparatus of this character which is simple in its construction and arrangement, efficient in its operation, and which obviates the necessity for the use of floats.

The nature of my invention will be best understood by reference to the accompanying drawings, in which I have shown two different embodiments thereof, which will now be described, it being premised, however, that various changes may be made in the details of construction and arrangement of the parts by those skilled in the art, without departing from the spirit and scope of my invention as defined in the appended claims.

Referring first to the form of my invention shown in Fig. 1, the numeral 2 designates a boiler, or boiler drum, which is supplied with water by means of a feed pipe 3 extending through a feed valve 4. This valve may be of any suitable or well known character. I have shown a double-balanced valve of well known form. The stem 5 of this valve extends upwardly into a diaphragm chamber 6, in which it is connected to a diaphragm 7 extending transversely across the chamber. Seated upon the upper side of the diaphragm is a spring 8, which extends upwardly within an extension 9 of the diaphragm casing, and is provided with a tension adjusting screw or other device 10. The valve stem 5 passes through the two stuffing boxes 11 in the lower portion of the diaphragm casing.

12 is a pipe, which extends through the upper portion of the shell of the boiler drum and downwardly within the drum to the desired water level. Connected to the upper end of this pipe is a horizontal pipe 13, which is connected at its opposite end to a chambered fitting 14. Extending downwardly from the bottom of this fitting is a vertical pipe 15, which is connected by a pipe 16 with the diaphragm chamber above the diaphragm. The extended lower end of the pipe 15 is connected with the water space of the boiler, as shown at 17. Connected with the fitting 14 above the point of connection of the pipe 13 is a horizontal pipe 18, which, at its opposite end is connected with a vertical pipe 19, whose lower end leads into the diaphragm chamber below the diaphragm.

20 designates a cut-off valve located in the pipe 12, and 21 is a similar valve, which is located in the connection between the lower end of the pipe 15 and the water space of the boiler. 22 is a check valve placed in the last named connection, and which may or may not be employed, as may be desired. I prefer, however, to employ this valve, since without it, if the boiler surges or "foams" as is often the case, the water leg 15 might become filled when the water level of the boiler is below the desired level.

23 is a pet cock connected to the fitting 14 for the purpose of allowing the air to escape from the pipe system in starting the operation of the boiler and regulator.

The operation of the parts just described is as follows: The diaphragm chamber is kept constantly filled with water upon both sides of the diaphragm, and the vertical pipe 19 is also filled with a column of water. To insure the retention of water in the upper portion of the diaphragm chamber, the pipe connection 16 is preferably provided with a bend or trap 16^a. When the water in the boiler is below the water level, the lower end of the pipe 12 is open and the pipes 12, 13, 15 and 18 are filled with steam. The under side of the diaphragm will, therefore, be subjected to the steam pressure of the boiler plus the pressure of the column of water in the vertical pipe 19. The upper side of the diaphragm will be subjected only to the pressure of steam in the boiler acting through the water in the upper portion of

the diaphragm chamber. The pressure upon the under side of the diaphragm will, therefore overbalance that upon the upper side, and the valve 4 will be held open. When the water rises in the boiler to the water line, the water closes the lower end of the pipe 12 and prevents further admission of steam to said pipe. The pressure of steam within the boiler will then force water upwardly into the pipe 12, and will fill the pipe system with water. The diaphragm will then be subjected to equal water pressures upon both sides, the heights of the vertical pipe 15 being equal to the height of the vertical pipe 19. The spring 8 then immediately acts upon the diaphragm to close the valve until such time as the water in the boiler falls below the water line. As soon as this occurs, the water in the pipes 12, 13 and 18 returns to the boiler by gravity, and the water in the pipe 15 falls to the level of the water in the boiler; and the valve 4 is again opened by the excess of pressure acting on the under side of the diaphragm. The return connection 17 may terminate at the points shown at full lines in Fig. 1, or it may be extended as shown in dotted lines through the water-circulating baffle 2^a. The direction of circulation of water within this baffle is in the direction of the arrow, and this will facilitate somewhat the return of water from the pipe system into the boiler.

The embodiment of my invention shown in Fig. 2 is similar to that shown in Fig. 1, except that the pipe connections instead of being made directly with the steam and water spaces of the boiler drum, are made with the steam and water spaces respectively of a water column 24, which is connected with the boiler in the usual manner. The various pipes shown in this figure are lettered in the same manner as the corresponding pipes shown in Fig. 1 with the addition of the letter "a". By making the connections with the water column instead of directly with the water drum, I avoid the necessity for forming additional holes for the connections in the shell of the drum. In this form of my invention, I have omitted the spring 8, and employ instead a weight lever 25 connected to the stem 5^a of the valve 4^a. This weight lever acts in precisely the same manner as the spring, to close the valve when the pressure at opposite sides of the diaphragm is otherwise balanced in the manner before described.

The apparatus described forms a simple and efficient feed water regulator, which can be relied upon to maintain the water level of the boiler at the desired point.

The apparatus is simple in its construction and mode of operation, and obviates the use of expansion tubes or of floats and float connections. By keeping the diaphragm chamber filled with water constantly from both sides of the diaphragm, the diaphragm is protected from contact with the steam, and its life is greatly extended. I may provide a screw 26 or 26^a, or other suitable means arranged to engage the lower end of the valve 4 or 4^a, and providing means for manually opening said valve, if for any reason the apparatus should fail to operate automatically.

It will be understood that wherever in the claims I refer to connections with the water and steam spaces of the boiler, this is to be understood as referring either to direct connections such as shown in Fig. 1, or to indirect connections through a water column, as shown in Fig. 2.

What I claim is:—

1. In a boiler feed regulator, a feed valve, a diaphragm to which the valve is connected, a chamber containing the diaphragm, water legs of substantially equal height communicating with said chamber at opposite sides of the diaphragm, one of said legs having a constant height of water therein to act upon the diaphragm to hold the valve open, and the other leg being normally empty, a passage connecting the other of said legs with the water space of the boiler and arranged to be sealed by the rise of water in the boiler, and auxiliary means connected to the valve and tending to close it, and a return or discharge connection between the normally empty leg and the water space of the boiler; substantially as described.

2. In a boiler feed regulator, a feed valve, a diaphragm to which the valve is connected, a chamber containing the diaphragm, water legs of substantially equal height communicating with said chamber at opposite sides of the diaphragm, one of said legs having a constant height of water therein to act upon the diaphragm to hold the valve open, and the other leg being normally empty, a passage connecting the other of said legs with the water space of the boiler and arranged to be sealed by the rise of water in the boiler, and auxiliary means connected to the valve and tending to close it, and a return or discharge connection between the normally empty leg and the water space of the boiler, together with an equalizing connection between the upper portions of the two water legs; substantially as described.

3. In a boiler feed regulator, a feed valve, a diaphragm to which the valve is connected, a chamber containing the diaphragm, water legs of substantially equal height communicating with said chamber at opposite sides of the diaphragm, one of said legs having a constant height of water therein to act upon the diaphragm to hold the valve open, and the other leg being nor-

mally empty, a passage connecting the other of said legs with the water space of the boiler and arranged to be sealed by the rise of water in the boiler, and auxiliary means connected to the valve and tending to close it, and a return or discharge connection between the normally empty leg and the water space of the boiler, together with a check valve in such return or discharge connection; substantially as described.

In testimony whereof, I have hereunto set my hand.

HAROLD K. GOWDY.

Witnesses:
H. M. CORWIN,
GEO. H. PARMELEE.