

T. G. RAKESTRAW.
 BOILER FEEDER AND WATER LEVEL MAINTAINING APPARATUS.
 APPLICATION FILED DEC. 5, 1910.

1,062,115.

Patented May 20, 1913.

2 SHEETS—SHEET 1.

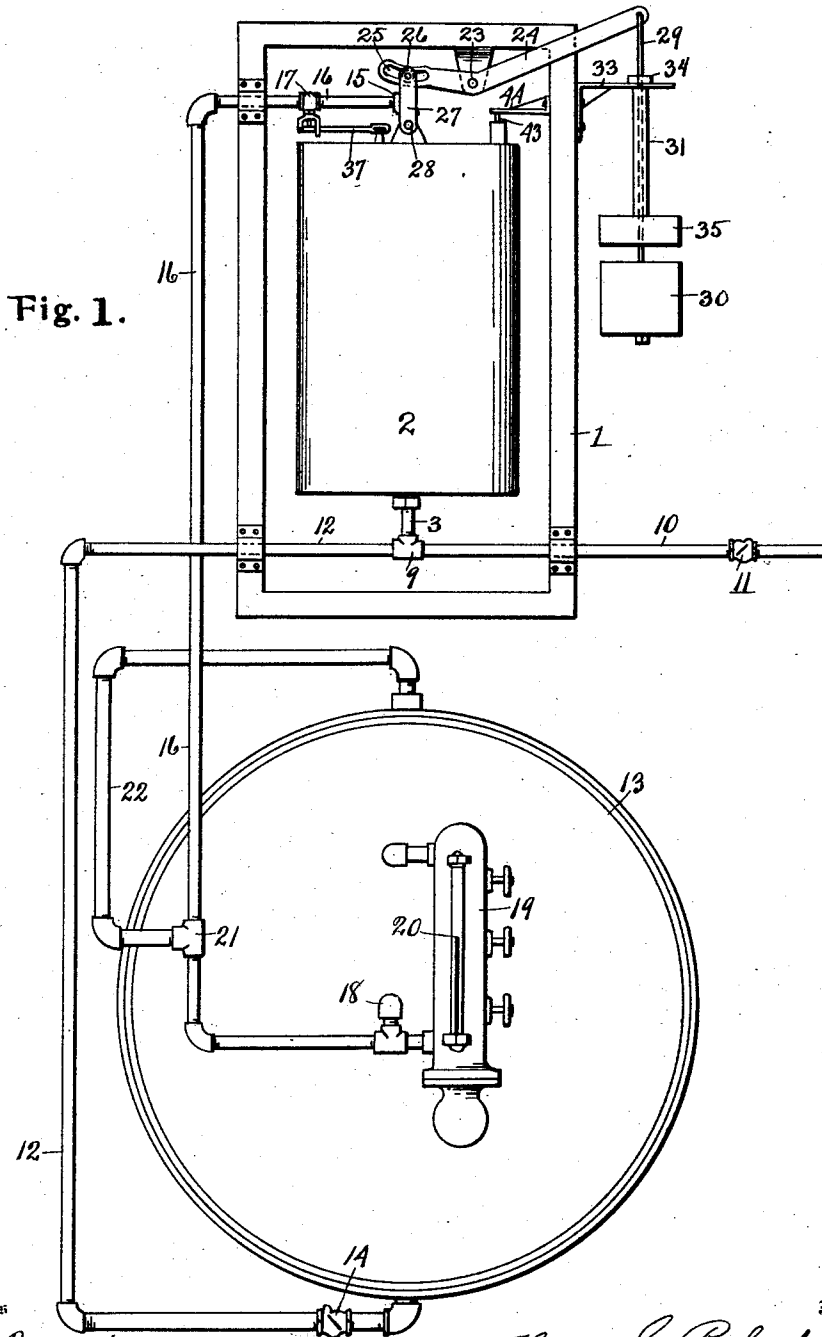


Fig. 1.

Witnesses

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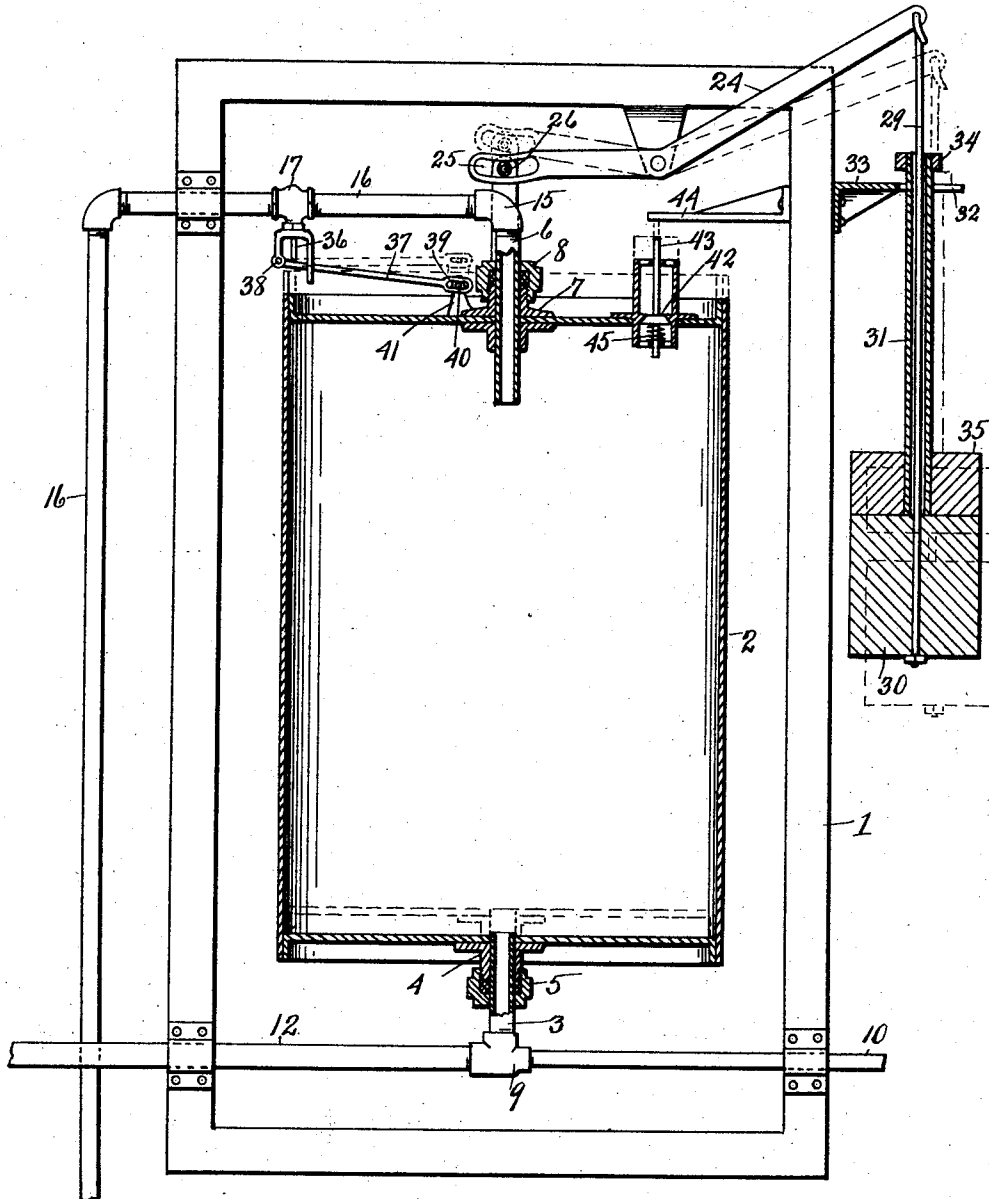


Fig. 2.

Witness

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BOILER-FEEDER AND WATER-LEVEL-MAINTAINING APPARATUS.

1,062,115.

Specification of Letters Patent.

Patented May 20, 1913.

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To all whom it may concern:

Be it known that I, THOMAS G. RAKESTRAW, a citizen of the United States, residing at Detroit, in the county of Wayne, State of Michigan, have invented certain new and useful Improvements in Boiler-Feeders and Water-Level-Maintaining Apparatus; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to a steam boiler feeder and water level maintaining apparatus, and consists in the construction and arrangement of parts hereinafter more fully set forth and pointed out particularly in the claims.

The object of the invention is to provide simple and efficient means for automatically feeding water to a steam boiler from time to time in such quantities as may be required and for maintaining the water in the boiler at a uniform predetermined level, thereby obviating the danger of low water and overcoming the annoyance incident to overfeeding.

The above object is attained by the mechanism illustrated in the accompanying drawings, in which:—

Figure 1 is a general view in elevation, showing one method of applying my water feeder and regulating device to a steam boiler. Fig. 2 is an enlarged fragmentary view, partly in section, showing the vertically reciprocatory tank, the counterpoise therefor and the water and steam pipes connected therewith.

Referring to the characters of reference, 1 designates the stationary frame of any suitable construction which is located adjacent to and above the boiler to afford the required hydrostatic pressure. Mounted in the frame 1 is a vertically reciprocatory tank 2 of such a structure as to withstand the pressure of the boiler with which the apparatus is connected. The tank 2 is preferably cylindrical in form and its ends are apertured to receive the vertical pipes which communicate therewith. The lower vertical pipe 3 which is both the induct and educt water pipe communicates with the

bottom of said tank through a suitable fitting 4 onto which is screwed a gland 5 to prevent leakage, said fitting 4 and gland 5 being adapted to slide vertically upon the pipe 3 to accommodate the vertical movement of the tank. The arrangement being such that the upper end of pipe 3 shall be below or on a plane with the bottom of the tank when said tank is raised. Extending into the upper end of the tank is a vertical pipe 6 which passes through a fitting 7 and a gland 8 embracing said pipe and screwed onto said fitting. By this arrangement said parts are permitted to slide vertically on the pipe 6 without leakage. The lower end of the pipe 3 is provided with a T 9 into which is connected the water supply pipe 10 leading from any suitable source of water supply under pressure to feed the water into the tank 2. To prevent a backward flow of water through the pipe 10 a suitable check valve 11 is placed therein. Coupled into and leading from the T 9 is the feed water or educt pipe 12 which leads to and communicates with the water space of the boiler 13 through the bottom thereof, said pipe being provided near the boiler with a check valve 14 to prevent a backward flow into said pipe from the boiler. Communicating with the upper end of the pipe 6 through an elbow 15 is a steam pipe 16 having a valve 17 therein which controls the passage of steam therethrough. The pipe 16 leads downwardly and connects with the boiler, as at 18, below the normal water level. Mounted on the end of the boiler and connected therewith in the usual manner is a water gage 19. Located in the vertical portion of the pipe 16 on a line with the ordinary water level of the boiler, as shown at 20 in the gage, is a T 21 to which is connected a steam pipe 22 leading to the steam space of the boiler.

Pivoted at 23 on the frame is a lever 24 having at its inner end a curved slot 25 through which passes a pin or roller 26. The ends of said roller are mounted in the upper ends of the links 27 whose lower ends are pivoted at 28 to the top of the tank, as clearly shown in Fig. 1. Attached to the outer end of the lever 24 is a rod 29 carrying at its lower end a counterpoise 30, the weight of which is sufficient to balance that of the tank when empty. Embracing the rod 29 and through which said rod is adapt-

ed to move vertically, is a tube 31 which lies in and is adapted to move vertically through a slot 32 in the bracket 33 secured to the frame 1. The upper end of the tube 31 is provided with a collar or head 34 adapted to engage the margins of the slot 32 to prevent the tube 31 passing therethrough. At the lower end of the tube 31 is an auxiliary counterpoise 35. When the tank 2 is in its lowermost or discharging position, as shown in Fig. 2, both weights are suspended from the lever 24, but when said tank is in its uppermost position, as shown in Fig. 1, the main counterpoise 30 only is suspended from the lever 24, the auxiliary counterpoise 35 being suspended by the tube 31 whose head 34 engages the bracket 33 in a manner to suspend said tube and auxiliary counterpoise therefrom.

The stem 36 of the steam-controlling valve 17 depends through the valve case into engagement with an actuating lever 37, one end of which is pivotally connected at 38 to said valve case, the other end of said lever being provided with a slot 39 through which passes a pin 40 carried by the brackets 41 mounted on the end of the cylinder. By this arrangement the vertical movement of said cylinder actuates the valve stem 36 to open the valve 17. In the upper end of the cylinder 2 is a spring-restrained vent valve 42 whose stem 43 projects vertically to be engaged by the trip arm 44 mounted on the frame 1 when the tank shall have reached the limit of its upward travel.

The operation of the device may be described as follows—assuming that the tank has just discharged its contents into the boiler and is in its lowermost position, as shown in Fig. 2. The tank when empty being lighter than the two weights 30 and 35, will be raised thereby through the operation of the lever 24. As the weights descend in lifting the tank, the auxiliary weight 35 will be arrested by engagement of the head of the tube suspending it with the bracket 33 before said weights reach the limit of their downward movement, thereby checking the momentum of the tank and preventing it from reaching the limit of its upward travel with too much impact. As the tank moves upwardly the valve stem 36 will be actuated through the lever 37 to close the valve 17 and the stem 43 of the valve 42 will engage the trip arm 44 and open said relief valve against the action of its spring 45. The opening of said relief valve will allow any steam pressure which may remain in said tank to escape, thereby permitting water to flow into said tank through the induct pipe 10 past the check valve 11. When the tank becomes filled with water, it will overbalance the counterpoise 30 and will descend. Said counterpoise will be lifted as the tank travels downwardly, and in its up-

ward travel will pick up the auxiliary counterpoise or weight 35, whereby the momentum of the tank will be arrested before it reaches the limit of its downward movement, obviating excessive shock and jar. The downward movement of the tank carries the lever 27 away from the end of the valve stem 36, allowing said valve to open and admit steam under boiler pressure into the upper end of the tank. As said tank moves downwardly, the valve stem 43 is carried away from the trip arm 44, allowing the relief valve 42 to close, thereby preventing the escape of steam through said vent valve. Upon opening the steam valve 17 the pressure in the tank becomes balanced, and because of the elevation of the tank above the boiler, the water contained in the tank will flow by gravity through the pipe 12 past the check valve 14 into the water space of the boiler. In this position of parts the check valve 11 in the supply pipe will close to prevent pressure from the boiler passing outwardly therethrough. As soon as the water shall have been discharged from the tank 2 into the boiler, the combined weight of the weights 30 and 35 will overcome the weight of the empty tank and raise it as before described, said tank as it moves upwardly actuating the valve 17 to cut off the flow of steam and opening the vent valve 42 to permit the contained pressure therein to escape, when the tank will again fill with water and the operation will be repeated. In the upward movement of the tank the water continues to discharge, so that when the weight 35 is arrested its reduced weight and momentum will cause it to continue to move upwardly notwithstanding this reduction in the weight of the counterpoise, an arrangement which prevents the tank striking with too much force when it reaches the limit of its upward travel. When the water in the boiler shall have attained its normal level, it will fill the lower end of the pipe 16 above the point of communication of the steam pipe 22 therewith, thereby cutting off the steam from entrance into said pipe 16 and stopping the operation of the feeding device until such time as the water level is lowered below the point of communication of the steam pipe 22 with the pipe 16 at the T coupling 21, when steam will again be allowed to flow through the pipe 16 and the apparatus will again operate to feed water into the boiler. It will now be apparent that by means of this apparatus water will be continuously fed into the boiler as long as the water level therein remains below the normal and that as soon as said water level shall have been restored, the operation of the device will cease, to again commence upon the lowering of the water level.

The apparatus in its operation maintains

the water in the boiler at substantially the mean level, obviating the danger of low water and preventing the feeding of an excessive quantity of water into the boiler.

5 Having thus fully set forth my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A steam boiler feeder comprising a vertically movable tank, a fixed frame, fixed
10 pipes mounted on said frame and having vertically alined terminals which enter the ends of the tank and on which said tank is adapted to slide, the pipe communicating
15 with the upper end of said tank leading to a source of steam pressure and the pipe communicating with the lower end of said tank being a water educt and a water induct pipe,
20 a counterpoise for said tank, a valve in the steam pipe, a lever for said valve connected to the tank to be actuated as the tank moves vertically, a relief valve in the tank adapted
25 to be actuated as the tank moves upwardly, a check valve in the water educt pipe, and a water supply pipe communicating with the tank through said educt pipe.

2. A steam boiler feeder, comprising a vertically movable tank, a fixed frame, a steam boiler, fixed pipes mounted on said frame
30 communicating with the ends of said tank and having stationary vertical portions on which said tank is adapted to slide, the pipe communicating with the upper end of the tank leading to the steam space of the boiler, the pipe communicating with the
35 lower end of said tank leading to the water space of the boiler, an automatically variable counterpoise for the tank, the maximum weight of which is opposed to the tank when the tank is in its lowermost position

and the minimum weight of which is op- 40
posed to the tank when the tank is in its uppermost position, a valve in the steam pipe connected to the tank to be actuated
45 as the tank moves vertically, a relief valve in the tank adapted to be opened as the tank moves upwardly, and a water supply pipe communicating with said tank.

3. A steam boiler feeder comprising a stationary frame, a vertically movable tank mounted on said frame, stationary pipes
50 communicating with said tank, said pipes having axially alined fixed terminal portions which pass through the ends of said tank on which said tank slides vertically, a
55 steam boiler, the pipe communicating with the upper end of said tank leading to the steam space of said boiler, the pipe communicating with the lower end of said tank leading to the water space of said boiler and
60 its upper end terminating on a plane with the bottom of the tank when said tank is raised, a valve in the steam pipe connected with said tank to be actuated as the tank moves vertically, a vent valve in the
65 tank adapted to be actuated as the tank moves upwardly, a pipe communicating with the water space of the boiler and connected to said steam pipe on the plane of the normal water level, and a valve-controlled water supply pipe communicating
70 with said tank.

In testimony whereof, I sign this specification in the presence of two witnesses.

THOMAS G. RAKESTRAW.

Witnesses:

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T. G. HOWLETT.