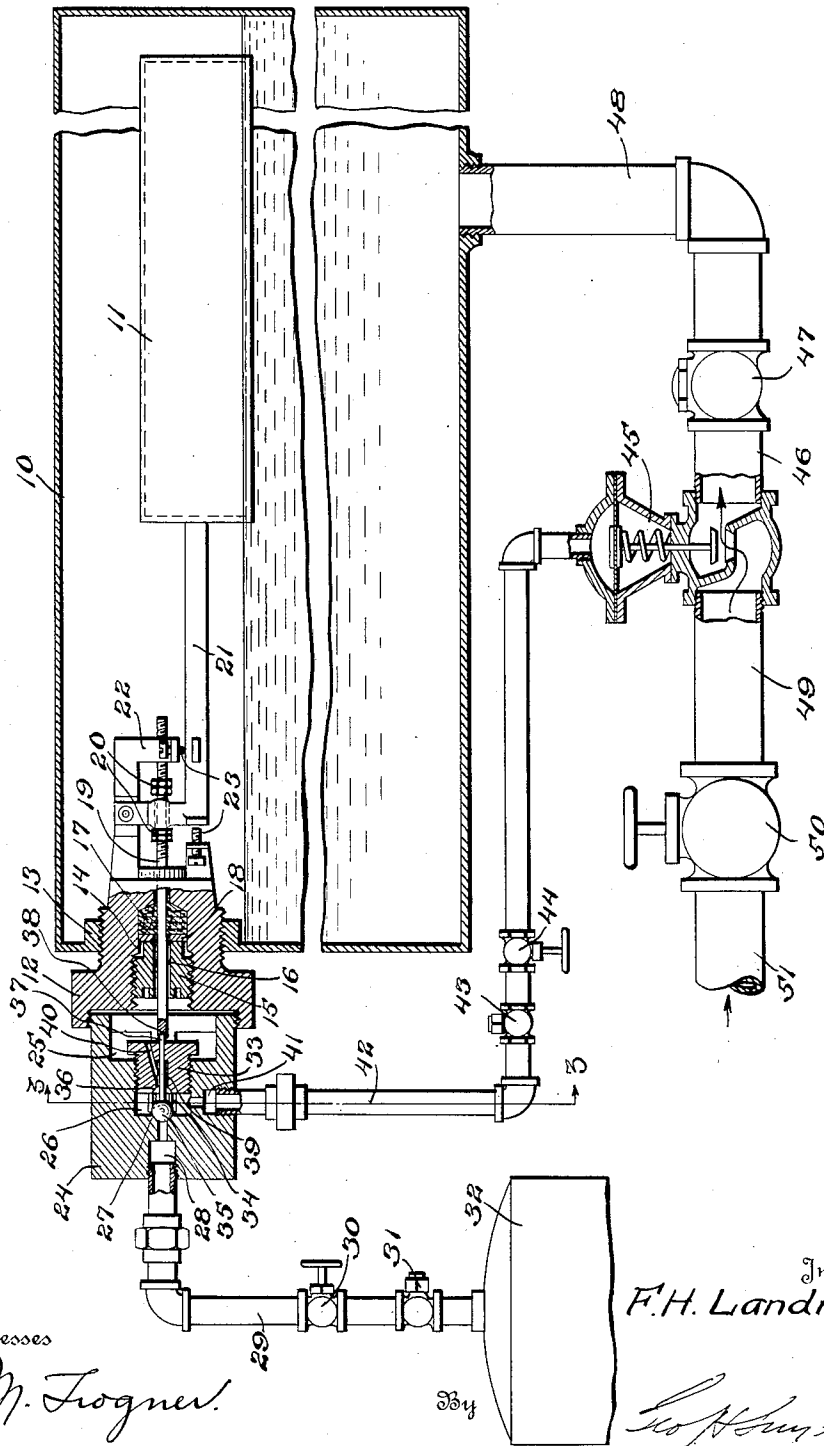


F. H. LANDRUM.
 AUTOMATIC LIQUID LEVEL CONTROLLER.
 APPLICATION FILED SEPT. 4, 1915.

1,354,311.

Patented Sept. 28, 1920.
 3 SHEETS—SHEET 1.

FIG. 1.



Witnesses

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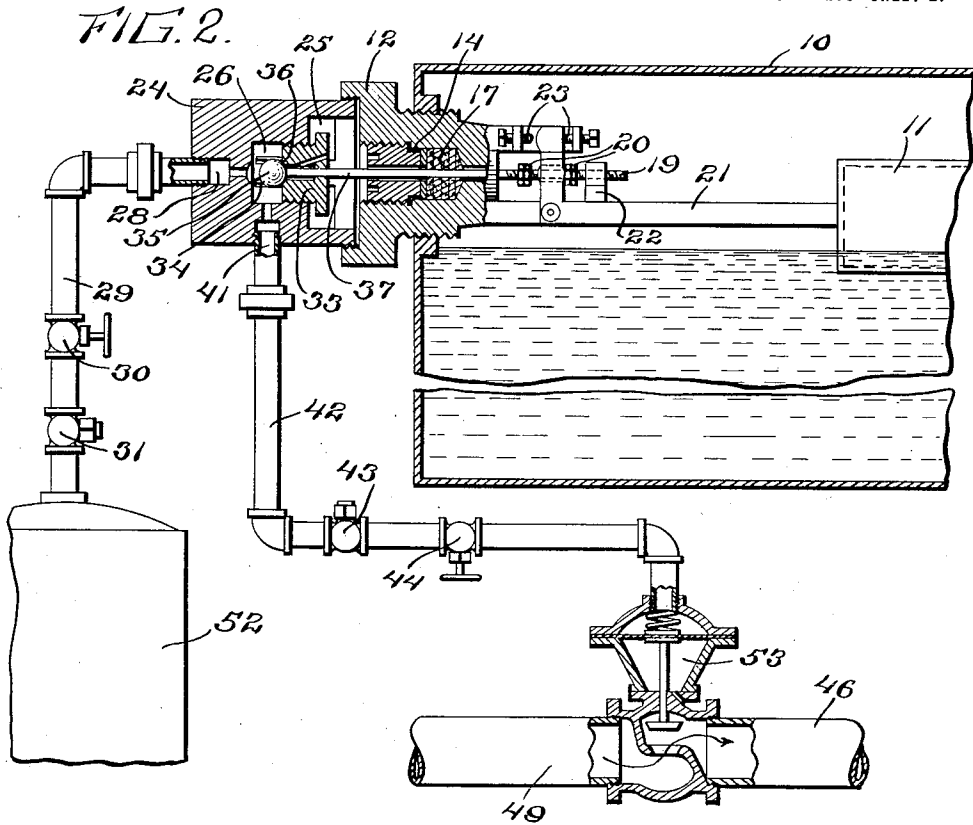
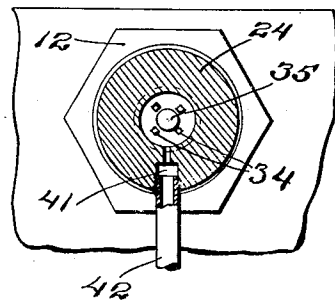


FIG. 3.



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3 SHEETS—SHEET 3.

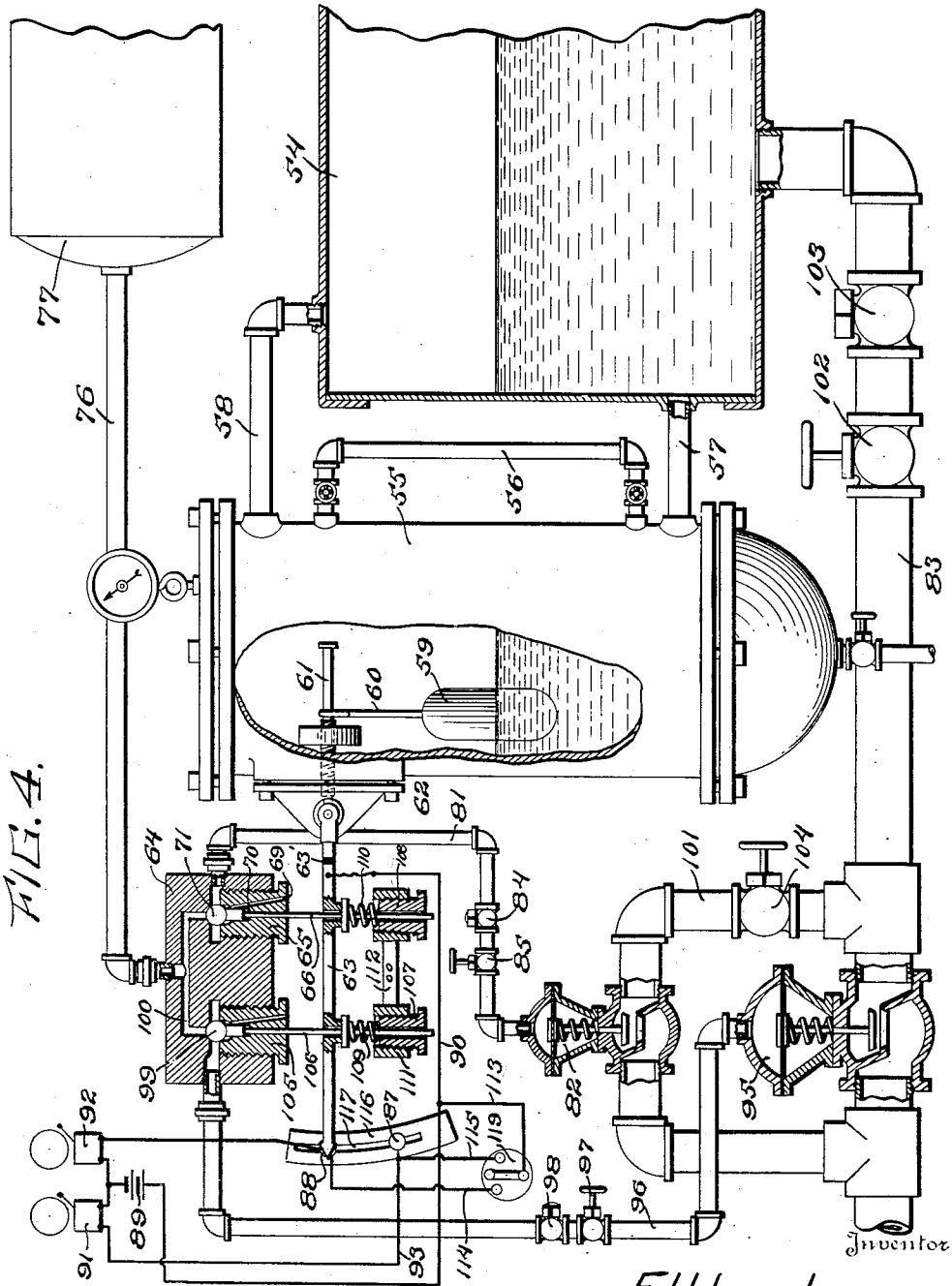


FIG. 4.

Witnesses

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AUTOMATIC LIQUID-LEVEL CONTROLLER.

1,354,311.

Specification of Letters Patent. Patented Sept. 28, 1920.

Application filed September 4, 1915. Serial No. 49,104.

To all whom it may concern:

Be it known that I, FRANCIS H. LANDRUM, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Automatic Liquid-Level Controllers, of which the following is a specification.

This invention relates to devices for automatically controlling the height of water in boilers, water tanks, and the like.

The objects of the invention are to improve the general construction of devices of this character; to provide an improved arrangement of tank and valve for regulating the height of water in a boiler or the like; to provide an improved form of valve for use in connection with such apparatus; to provide an improved form of high and low water alarm, which will cause an alarm to be given in the immediate vicinity of the boiler or at a distant point, such as in the superintendent's office, or at both; to reduce boiler explosions to a minimum, thereby preventing the loss of life and property, especially when the cause is due to lack of water in boiler; to economize in fuel, by having a constant feed of water in proportion to the amount of steam used, thus eliminating sudden inlet of water, and forcing boiler fires to make steam intermittently; partially or entirely to remove the human element in the operation of boilers, especially as the same pertains to the keeping of the boiler filled with water at a predetermined level; and to provide a mechanical liquid level indicator which may be graduated in gages of water, or other arbitrary standard or calibration. Water gage glasses at best are hard to see, and many waters film the glass on the inside so that the level is difficult to determine.

With the above and other objects in view, the invention consists in general in certain novel arrangements of parts and combinations of details hereinafter fully described, illustrated in the accompanying drawings, and specifically claimed.

In the accompanying drawings,

Figure 1 is a sectional view partly in elevation showing the controlling tank and

valve with its connections and also showing the connections to the fluid or gas pressure supply which operates the device.

Fig. 2 is a view of a second modification wherein vacuum is employed for the operation of the device in place of fluid pressure.

Fig. 3 is a detail section on the line 3—3 of Fig. 1.

Fig. 4 is a view in side elevation, partly in section, of a modified form of the invention.

In the form of the device shown in Figs. 1 and 2, there is disclosed a tank 10 which is intended to illustrate the water column casting on a steam boiler, a tank for hot or cold liquids with or without pressure, a steam boiler, or any other similar device. Within this tank is a float 11 which may be of the ordinary hollow variety or may contain cork, bamboo, a liquid of low specific gravity, a gas having a high coefficient of expansion, or a coiled spring, in order to prevent collapsing under high temperature and pressure. Extending into one end of the tank 10 is a packing gland 12 which is held in position by being screwed into a thickened portion of the wall of the tank as at 13, see Fig. 1. This packing gland contains a chamber 14 and is provided with a packing gland nut 15 having an opening extending therethrough. On the inner end of this chamber 14 is located the packing 17 which is held in position by means of a washer 18 interposed between the packing and the nut 15. Through this packing gland and packing extends a valve operating rod 19, which is threaded on its inner end for the reception of limit nuts 20, between which operates a bent lever 21 connected to the float 11 and pivoted to an arm 22 projecting inward from the gland 12 so that as the float rises or falls, the lever contacts with one or the other of the nuts 20 and thereby moves the rod 19. These nuts are provided so that the float may move a certain distance without operating the rod 19 and thus the height of liquid may vary between desired levels. In order to prevent too great movement of the rod 19, stop screws 23 are provided on the arm 22.

Screwed into the outer end of the gland 12 is a valve casing 24 of the cage type so that openings 25 are provided in this casing. The casing 24 is also provided with a valve chamber 26 having a seat 27 communicating with a passage 28, which has connected thereto a pipe 29 provided with a valve 30 and strainer 31. This pipe 29 leads to any suitable source of fluid pressure, such as is indicated by the tank 32, the fluid being preferably compressed air or gas, steam, or hot or cold water under pressure, although this is a matter which may be varied to suit the particular case. Threaded into the chamber 26 is a valve stem guide 33 carrying a cage 34 wherein is mounted a ball valve 35 adapted to seat either against the valve seat 27 or against a valve seat 36 formed in the guide 33. This ball valve 35 is provided with a stem 37 which loosely abuts a concaved end 38 formed on the rod 19. Leading from the valve seat 36 is a passage 39 having a branch 40 which opens into the atmosphere through one of the openings 25 of the cage.

Extending laterally from the chamber 26 is a passage 41 whereto is connected a pipe 42 provided with a strainer 43 and valve 44. This pipe 42 communicates with a pressure operated diaphragm valve 45 of any preferred type. To one side of this valve is connected a nipple 46 leading to a check valve 47 which in turn has connected thereto a supply pipe 48 leading to the vessel 10. The other side of the valve 45 is connected by a nipple 49 to a valve 50 which in turn is connected by a pipe 51 to a supply of whatever liquid the vessel 10 is intended to hold.

It will be noted that the construction in both Figs. 1 and 2 is identical, except that in Fig. 2 there is provided, in place of the pressure tank 32 a vacuum tank 52 and in place of the pressure operated diaphragm valve 45, the valve 53, shown in Fig. 2, is a vacuum operated diaphragm valve.

The operation of the device shown in Fig. 1 is as follows: The parts in this figure are illustrated in the positions they assume when the water is below the desired level. Under these conditions it will be seen that the valve 45 is open. Now as the water level rises the float 11 will rise and this will effect movement of the stem 37 to the right in said figure. As a result the ball 35 moves from the position shown to a position such as to close the duct or bleeder 40. This will permit the pressure from the tank 32 to be exerted on the diaphragm of the valve 45 and close this valve. When the water level again falls the ball valve will close off the supply from the tank and the pressure above the diaphragm will be reduced by the opening of the bleeder so that the valve 45 may open.

In the operation of the modification shown in Fig. 2 it is to be understood that the parts are also in the position of low water. Under these conditions, since 52 is a vacuum tank, the valve 53 will be open. If, however, the water level in the tank 10 rises the ball 35 will close off the vacuum tank and the air will enter through the duct or bleeder and force the valve 53 to closed position, the valve, of course, opening again as soon as the water level drops and the atmospheric pressure is shut off and the vacuum tank placed in communication with the chamber above the diaphragm of valve 53.

The operation of the modification shown in Fig. 2, the parts being also shown in low water positions, is exactly analogous to the operation of Fig. 1 since the tank 77 is a pressure tank.

In Fig. 4 is shown an arrangement to permit a constant feed of water into the boiler in proportion to steam used. In addition to the parts shown in the other figures, there are included a high level diaphragm motor valve 95 that is connected by a pipe 96 with the valve casing 64, the pipe 96 including cut-off valve 97 and a strainer 98. This casing contains a ball valve 99, which in conjunction with the ball valve 71 controls passage through a by-pass 100 communicating with the pipe 76 leading to the tank 77 and the pipe 81 leading to the diaphragm valve 82, the latter being carried by a by-pass 101 connecting with the pipe 83 leading to the boiler or reservoir 54, the pipe 83 including a valve 102 and a strainer 103, while one branch of the by-pass carries a throttle valve 104. The valve casing nut 105 is complementary to the nut 65 and the stem 106 to the stem 66. The adjusting screws 107 and 108 which regulate the tension of the springs 109 and 110 are disposed in casings 111 connected by a bracket or brace 112 secured to any suitable support.

Included in the alarm circuits is a call-and-test switch 119 including three binding posts, from one of which leads a wire 113 tapped into the conductor 90, while from the other two binding posts lead wires 114 and 115 that are connected, the former with the contact plate 88 and the latter with the lead wire 93. The plate 116 carrying the contacts 87 and 88 is provided with an arcuate slot 117 in which the contacts are adjustably mounted in order to shorten or lengthen the period of the alarms.

In operation, assuming that the boiler is filling and the valves 82 and 95 are open, under such conditions the ball valves 71 and 99 will be seated. As the float 59 rises, the arm 63 will lower the ball valve 99, admitting pressure to close valve 95. As the liquid continues to rise, the ball valve 71

will open and permit pressure to close valve 82. If dirt should be under the seats of either the valves 82 or 95, the arm 63 will move into engagement with the contact 87 thereby closing the circuit to the high water alarm bell, and sounding an alarm in the boiler room, or at any other desired point, and challenging the attention of the fireman or superintendent. The normal feed of the boiler is supplied through the valve 82 and is controlled by the valve 104, whereby the valve 82 closes only when the boiler feed is below normal. The valve 95 is closed except when the boiler feed is above normal, at which time it opens. As the boiler water level lowers, the arm 63 rises, and the ball valve 99 is seated, shutting off the pressure, thereby opening the valve 82 and in turn ball-valve 99, and, should the device be out of order, the arm 63 will engage with the contact 88 and sound an alarm. The valves 82 and 95 may be fitted to the steam supply, or to a pump furnishing water direct to the boiler, thus eliminating the use of the reservoir tank.

There has thus been provided a simple and efficient device of the kind described and for the purpose specified.

It is obvious that many minor changes may be made in the form and construction of the apparatus without departing from the material principles thereof. It is not

therefore desired to confine the invention to the exact form herein shown and described, but it is wished to include all such as come within the scope claimed.

What is claimed as new is:—

The combination with a receptacle, of a packing gland extending through a wall of the receptacle, a valve casing secured to the packing gland and provided with a valve chamber having oppositely disposed seats, a nut secured in said chamber, one of said seats being arranged in said nut, a ball valve vibratile between the seats, a cage on the nut retaining the valve in position, a pressure regulating tank communicating with one of said seats and adapted to be closed off by the valve when in one position, a float in said receptacle provided with an operative connection to the ball valve, a fluid supply pipe leading to said receptacle, a valve in said supply pipe controlled by fluid pressure and a branch pipe leading from one side of the chamber intermediate the valve seats and communicating with the valve controlling the fluid supply pipe.

In testimony whereof I affix my signature in presence of two witnesses.

FRANCIS H. LANDRUM.

Witnesses:

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