Sept. 1, 1931. P. H. FLECK 1,821,699

LOW WATER AND PRESSURE GOVERNOR

Filed May 25, 1926 3 Sheets-Sheet 1

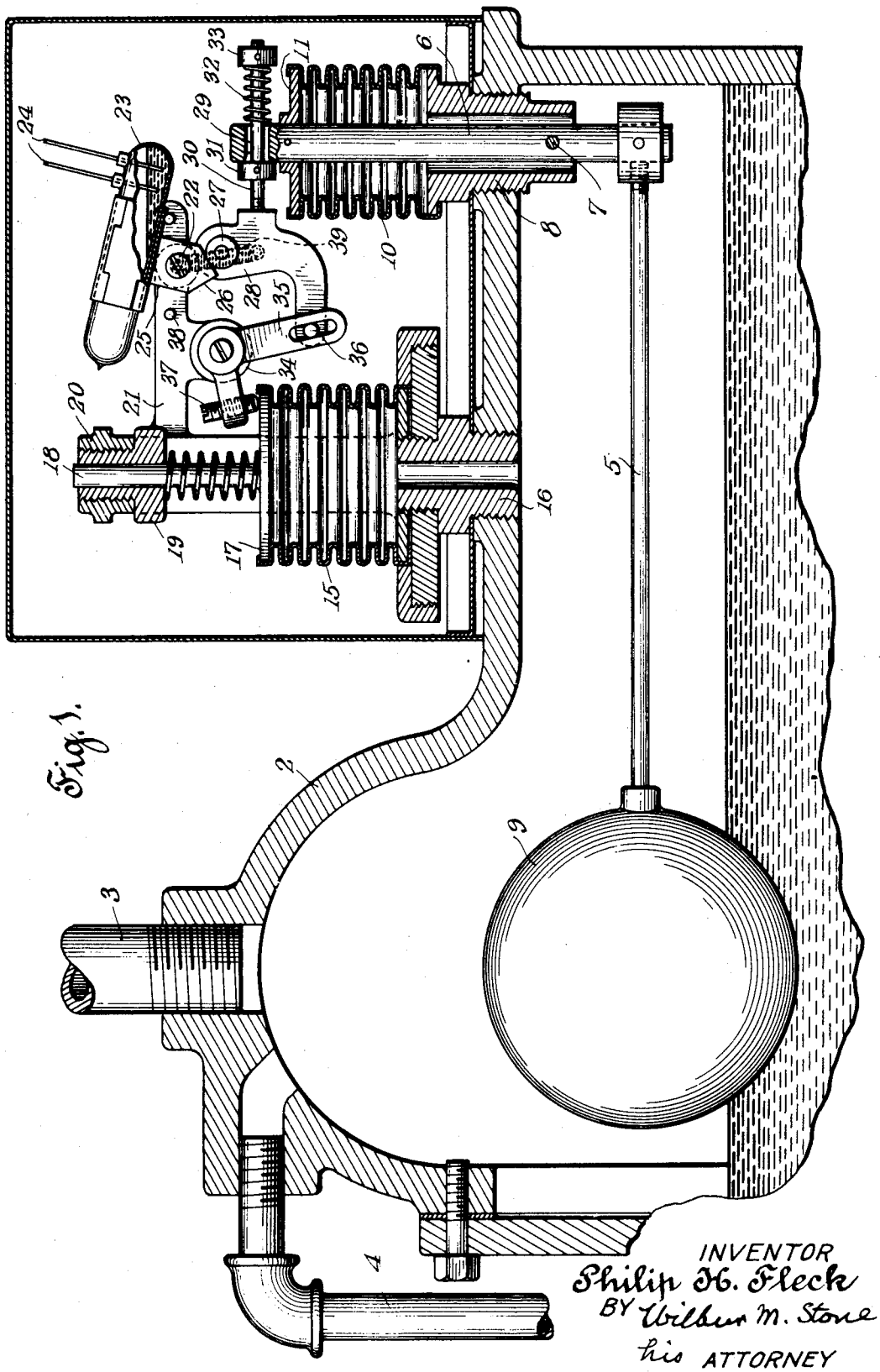


Fig. 1.

INVENTOR
Philip H. Fleck
BY Wilbur M. Stone
his ATTORNEY

Sept. 1, 1931. P. H. FLECK 1,821,699

LOW WATER AND PRESSURE GOVERNOR

Filed May 25, 1926 3 Sheets-Sheet 2

Fig. 2.

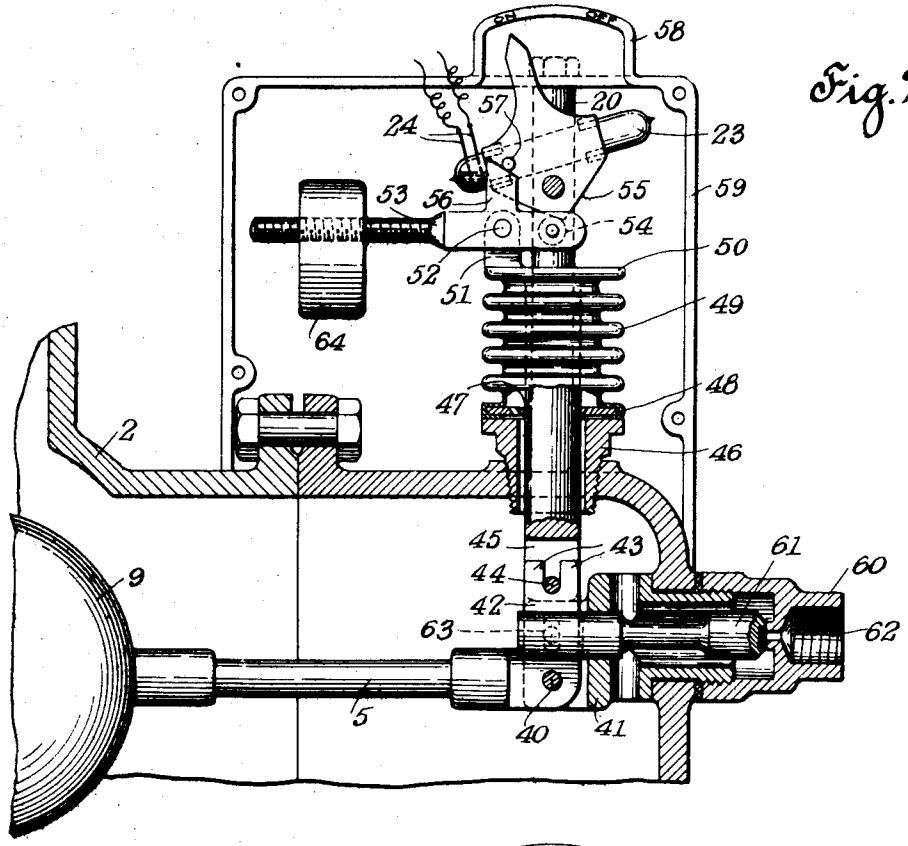
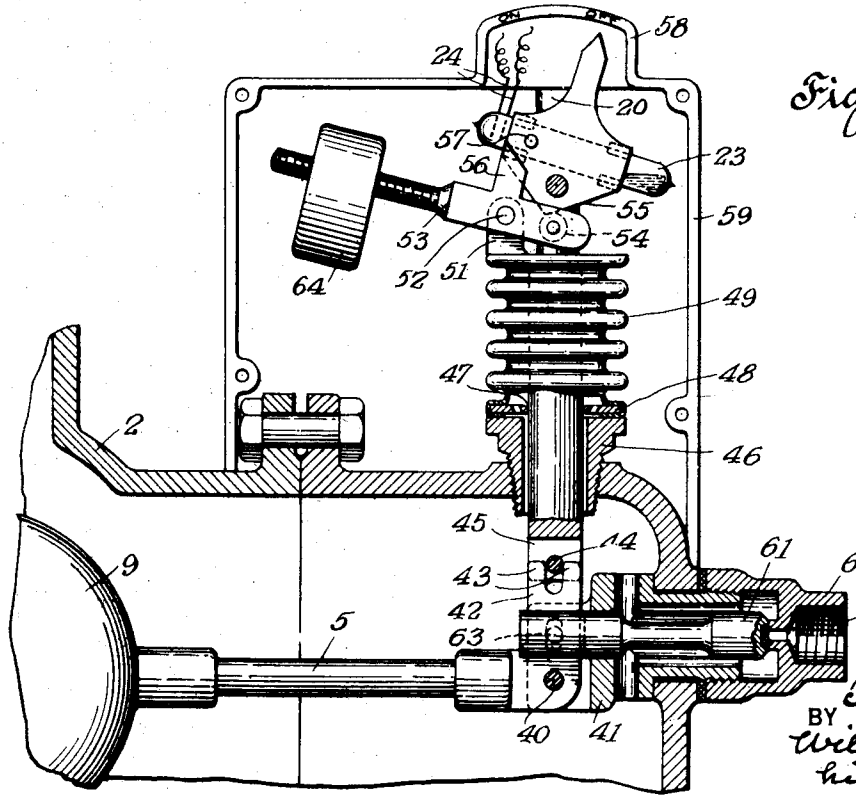


Fig. 3.



INVENTOR
Philip H. Fleck
BY
Wilbur M Stone
his ATTORNEY

Sept. 1, 1931. P. H. FLECK 1,821,699

LOW WATER AND PRESSURE GOVERNOR

Filed May 25, 1926 3 Sheets-Sheet 3

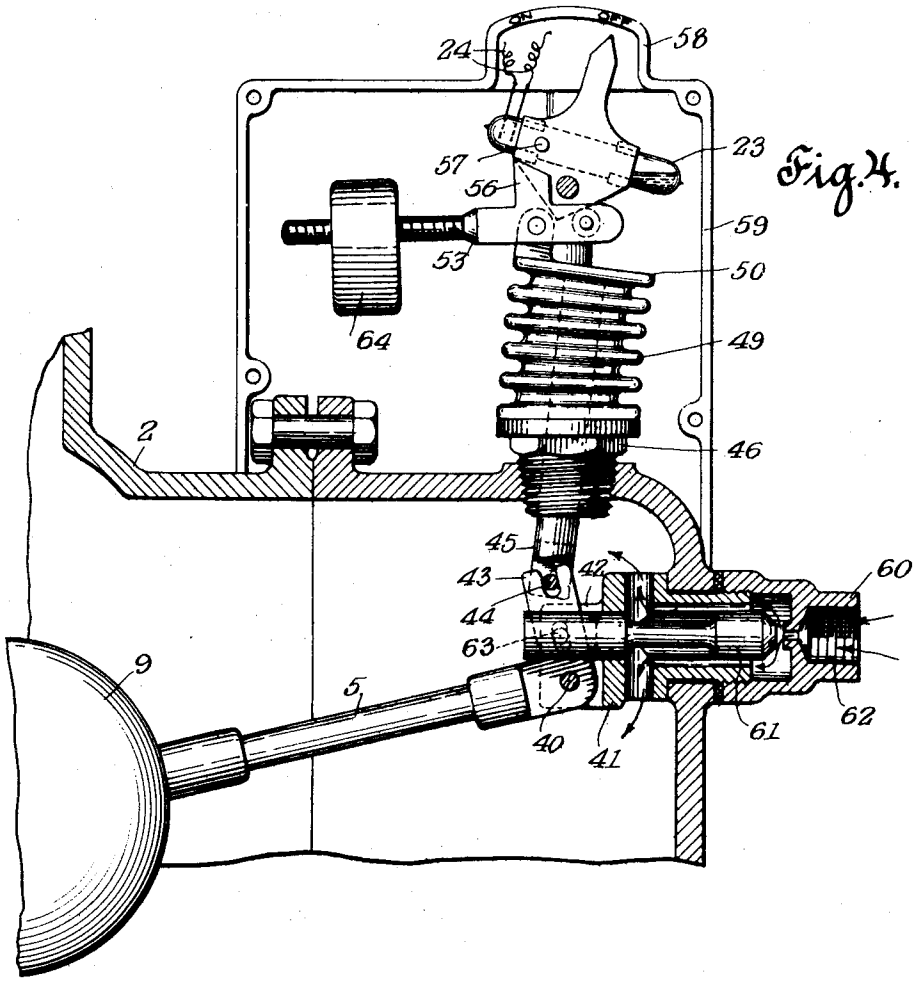


Fig. 4.

INVENTOR
Philip H. Fleck
BY
Colburn M. Stone
his ATTORNEY

Patented Sept. 1, 1931

1,821,699

UNITED STATES PATENT OFFICE

PHILIP H. FLECK, OF OSSINING, NEW YORK, ASSIGNOR OF ONE-THIRD TO ROBERT M. AKIN AND ONE-THIRD TO JOSEPH ROYLE, BOTH OF OSSINING, NEW YORK

LOW WATER AND PRESSURE GOVERNOR

Application filed May 25, 1926. Serial No. 111,497.

This invention relates to low-water and pressure governors and has for its object to provide a device of the character specified, of simple construction and accurate and sensitive in operation. Other objects of the invention will be pointed out in the following description.

The preferred form of my improved device is shown in the drawings accompanying this specification;

Wherein Figure 1 is a vertical longitudinal section of a float chamber to which my device is applied. Fig. 2 is a similar sectional view of a modified form of my improvements and Figs. 3 and 4 are similar views showing steps in the operation of the device.

Directing attention first to the showing of Fig. 1 the usual float chamber 2 is connected by pipe 3 with the upper portion of a steam boiler, not shown, and a similar pipe not shown may connect the lower portion of said chamber 2 with the lower portion of the steam boiler, all according to known practice. To the left hand end of said chamber the usual gage glass 4 is connected top and bottom, as usual.

Said chamber 2 is extended to the right a sufficient distance to accommodate float arm 5, fixed to the lower end of upright lever 6 pivoted at 7 in the lower end of nipple 8, projecting into said chamber 2. To the left hand end of arm 5 the usual float 9 is fixed. To the upper end of nipple 8, outside said chamber 2, the lower end of bellows 10, of known character, is fixed. The upper end of said bellows is fixed to head 11 in which is fixed the upper end of lever 6. The vertical opening through nipple 8 is large enough to permit lever 6 to swing without interference and the joints between the ends of bellows 10 and nipple 8, and head 11 respectively and between lever 6 and said head are steam tight.

Adjacent bellows 10 is a second bellows 15, the lower end of which is carried by nipple 16 through which it communicates with the interior of chamber 2. The upper end of said bellows 15 is fixed to head 17, the stem 18 of which extends upwardly for sliding guidance through nut 19 of yoke 20. Outstanding to the right from yoke 20 is arm 21 on which is pivotally mounted at 22 mercury switch 23 of known character. From said mercury switch wires 24 lead to some suitable apparatus of known character for governing heat under the boiler. Arm 25 of mercury switch 23 terminates downwardly in V shaped cam 26 which is engaged by roll 27 in arm 28. Roll 27 is urged to engagement with cam 26 by pull spring 39. Said arm 28 has rod 30 extending horizontally to the right therefrom and slidably mounted in transverse opening 29 through the upper end of lever 6. Collar 31, pinned to rod 30 takes the thrust of lever 6 in one direction and said rod may yield to the left under the tension of spring 32 between lever 6 and collar 33 fixed to said rod. In ear 34 depending from arm 21 is pivotally mounted bellcrank 35. The downwardly reaching arm of said bellcrank is slotted to receive pin 36 fixed in cam roll arm 28. The other arm of said bellcrank, reaching to the left, is provided with an adjustable screw 37 whose point impinges on the upper face of bellows head 17.

The operation of the device will be readily understood. When, from an excess of pressure in chamber 2, bellows 15 is expanded upwardly, bellcrank 35 is rocked in clockwise direction whereby arm 28 is drawn to the left and roll 27 passes under cam 26 of arm 25 rocking that arm and mercury switch 23 in anti-clockwise direction against stop 38, thereby breaking the electric circuit in wires 24. Upon the reduction of pressure in chamber 2 and bellows 15, the upward pressure against screw 37 will be relieved and spring 32 will withdraw roll 27 to the position of Fig. 1, thereby rocking the mercury switch to the position shown.

Or, in case of low water in chamber 2, float 9 will fall and the upper end of lever 6 be swung to the left, slightly distorting bellows 10 sideways and forcing arm 28 to the left whereby roll 27 will ride under cam 26 and rock the mercury switch in anti-clockwise direction, thereby breaking the electric current in wires 24, and through

suitable known means not shown, starting the feed-water pump or otherwise admitting water to the boiler and to chamber 2. Upon the rise of water in said chamber, float 9 is lifted and the mercury switch 23 is restored to the position shown in Fig. 1. It will be observed that no moving parts of the device slide through stuffing boxes, which stuffing boxes are notoriously prone either to stick or leak.

Directing attention now to the other figures of the drawings, in Fig. 2 the two separate devices for actuating the mercury switch are brought together and one bellows is employed instead of two. In this arrangement float arm 5 is pivoted at 40 in fixed bracket 41 in chamber 2 and the upper end of short lever 42 terminates in horns 43, 43, between which lies pin 44 of long lever 45 extending upwardly through nipple 46. Said lever 45 is fulcrumed in necked in portion 47 of the base 48 of bellows 49. As bellows 49 expands upwardly under pressure from the steam in chamber 2 said lever 45 rises therewith as its upper end is fixed to bellows head 50. Projecting upwardly from said bellows head 50 is ear 51 in which is pivoted at 52 short arm or lever 53 carrying at its right hand end roll 54 for engaging cam 55 of mercury switch 23 pivoted at 22 in post or yoke 20. Said lever 53 is counterbalanced at its left hand end by adjustable weight 64. Upstanding from lever 53 is horn 56 for engaging pin 57 of the mercury switch for starting the rocking movement of said switch.

In this modification, I have added an upwardly extending pointer from the mercury switch, to read against suitable indicators on hood 58 of case 59.

Also, in connection with water float 9, I have arranged valve 61 in inlet pipe 60 to be opened by lever 42 when the float falls. This valve is of plunger type, one end seating at 62 and the other end connected by pin 63 with lever 42.

The operation of this modification is similar to that of the device of Fig. 1. When pressure rises in float chamber 2, bellows 49 is expanded upwardly whereby horn 56 of lever 53 lifts pin 57 and the left hand end of mercury switch 23 and roll 54 rides under cam 55 and shifts said mercury switch in clockwise direction to the position of Fig. 3 thereby breaking the electric connection in wires 24. When the pressure is again lowered in chamber 2 bellows 49 will contract downwardly and the several parts be restored to the positions respectively of Fig. 2.

In case the water falls in chamber 2, float 9 descends therewith and the upper end of short lever 42 is swung to the left and the upper end of coacting lever 45 to the right, whereby horn 56 gives an initial upward movement to pin 57 and roll 54 rides under cam 55 rocking switch 23 in clockwise direction. Coincident with the described descent of float 9 valve 61 is withdrawn to the left, thereby admitting water through pipe 60 to chamber 2. When the water rises sufficiently in said chamber 2 the several parts of the apparatus will be restored to the respective positions of Fig. 2.

It will be understood that, while I have illustrated a mercury switch as the preferred device to be actuated by my improved mechanism, other switch devices known to the art, directed to similar ends may be used in place thereof.

I claim:

1. In a device of the character described the combination of a chamber, a lever pivoted therein, a float carried by said lever, means for admitting pressure to said chamber, a pivotally mounted switch, a cam on said switch, an arm carrying a roll for rocking said cam and means, including a bellows adapted to be expanded by pressure in said chamber, having said cam roll arm pivotally mounted thereon, said float lever being operatively connected with said bellows for oscillating the upper end thereof for causing said cam roll to rock said cam.

2. In a device of the character described the combination of a chamber, a lever pivoted therein, a float carried by said lever, means for admitting pressure to said chamber, a pivotally mounted switch, a cam on said switch, an arm carrying a roll for rocking said cam means, including a bellows adapted to be expanded by pressure in said chamber, having said cam roll arm pivotally mounted thereon, a horn on said cam roll arm and a pin on said switch adapted to be engaged by said horn for initially rocking said switch, said float lever being operatively connected with said bellows for oscillating the upper end thereof for causing said cam roll to rock said cam.

3. In a device of the character described the combination of a chamber, a lever pivoted therein, a float carried by said lever, a pivotally mounted switch, a cylindrical corrugated bellows, means for oscillating one end of said bellows from said lever and means for operating said switch from said bellows.

4. In a device of the character described the combination of a chamber, a lever pivoted therein, a float carried by said lever, a cylindrical corrugated bellows extraneous to said chamber, means for admitting pressure to said chamber and from said chamber to said bellows, a pivotally mounted switch, means for oscillating one end of said bellows from said lever, means for operating said switch from the oscillation of said bellows and means for operating said switch

from the expansion of said bellows by pressure from said chamber.

5. In a device of the character described the combination of a chamber, a lever pivoted therein, a float carried by said lever, means for admitting pressure to said chamber, a pivotally mounted switch, a bellows adapted to be expanded by pressure in said chamber and also oscillated by said lever and means operatively connecting said switch, float lever and bellows for operating said switch from said bellows or from said lever.

6. In a device of the character described the combination of a chamber, a lever pivoted therein, a float carried by said lever, means for admitting pressure to said chamber, a pivotally mounted switch, a bellows adapted to be expanded by pressure in said chamber, said float lever being operatively connected with said bellows for oscillating the upper end thereof and means operatively connecting said switch, float lever and bellows for operating said switch from said bellows or from said lever.

In witness whereof, I hereby affix my signature this 22nd day of May, 1926.

PHILIP H. FLECK.