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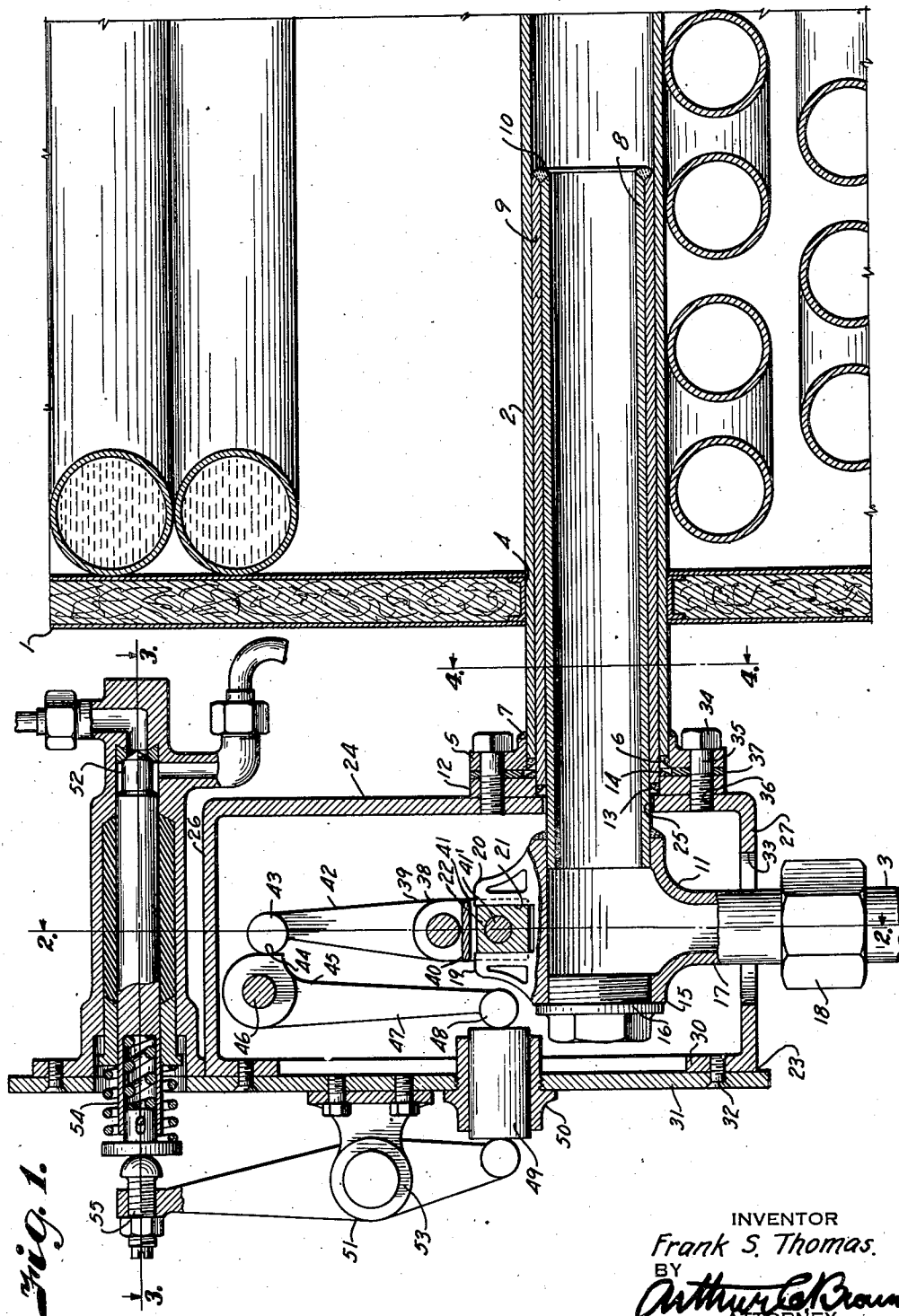
F. S. THOMAS

2,277,276

THERMOSTAT

Filed Feb. 17, 1939

2 Sheets-Sheet 1



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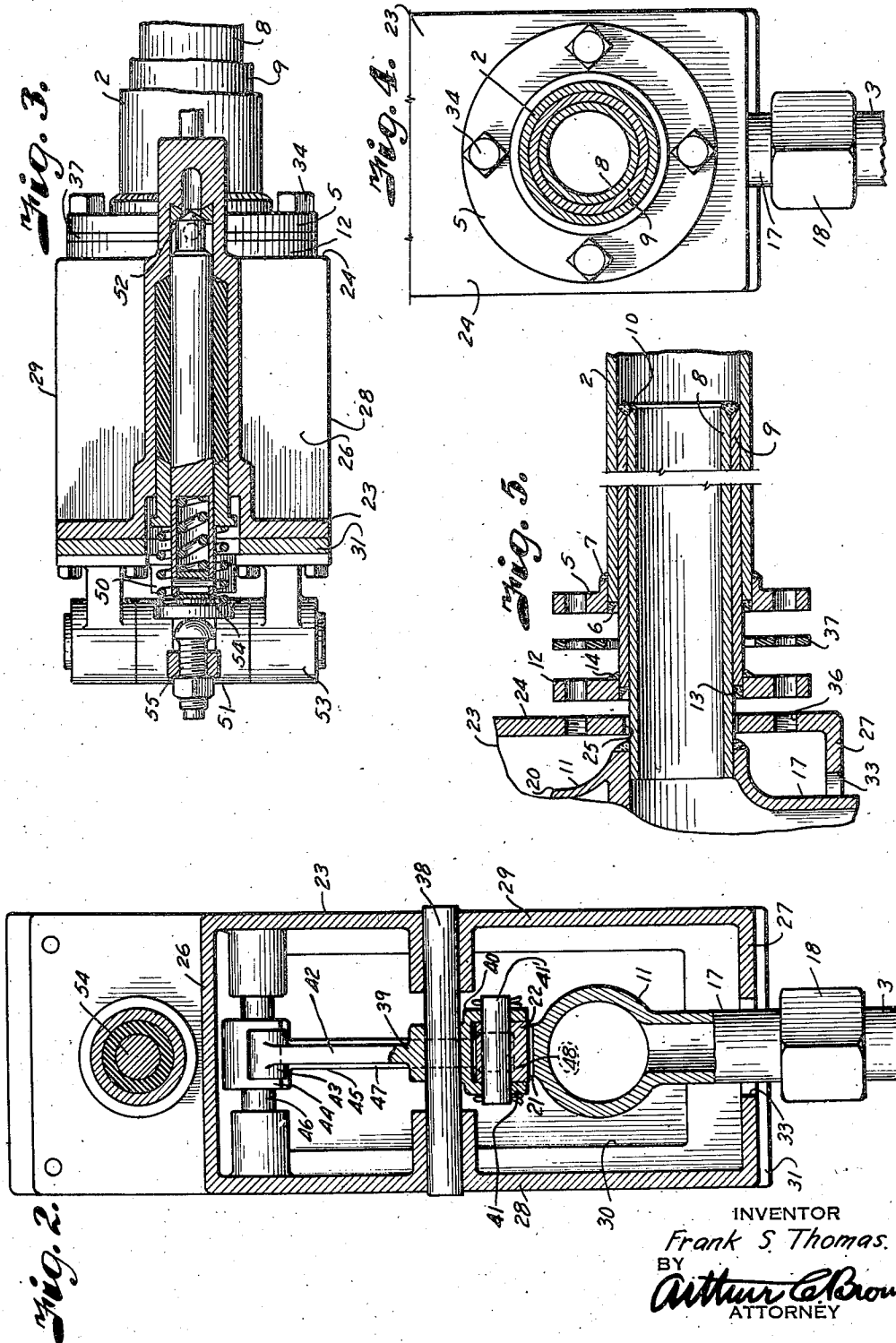
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UNITED STATES PATENT OFFICE

2,277,276

THERMOSTAT

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2 Claims. (Cl. 297—13)

This invention relates to thermostats adapted for insertion within flow lines of boilers, stills, and other appliances, and has for its principal object to provide a thermostat of this character which is accurate in operation and not subject to being insulated through calcium deposits and foreign material, such as usually accumulate in boiler systems.

Other objects of the invention are to provide a thermostat directly swept by fluid flowing there-through; to provide a thermostat structure which is directly contacted by the heat responsive medium; and to provide a thermostat designed for floating mounting to compensate for expansion and contraction occurring in the flow line or equipment with which it is connected.

It is a further object of the invention to provide a thermostat structure wherein the heat responsive elements form a flow channel so that they may have direct surface contact with a heated flow line or vessel in which the thermostat is inserted.

In accomplishing these and other objects of the invention, as hereinafter described, I have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a vertical section through a portion of a steam generator having a steam outlet tube or flow line equipped with the thermostat constructed in accordance with the present invention.

Fig. 2 is a vertical section on the line 2—2 of Fig. 1.

Fig. 3 is a horizontal section through a valve adapted for operation by the thermostat.

Fig. 4 is a cross-section through the thermostat elements on the line 4—4 of Fig. 1.

Fig. 5 is a detail section showing the thermostat elements and their attaching flanges in spaced relation to each other and the housing with which they are connected.

Referring more in detail to the drawings:

While my invention is adapted to many uses, I have illustrated it as applied to a steam generator 1 having a steam outlet tube 2 located within the heat zone of the generator and through which steam is discharged to a steam line 3. The tube 2 is slidable through a bushing 4 in the wall of the generator to compensate for expansion and contraction occurring therein or the steam coils with which it is connected. The tube 2 projects through the wall of the generator and

carries a flange 5 that is welded thereto as indicated at 6 and 7.

The thermostat embodying the features of the present invention is supported by the tube 2 and includes telescoping, tube-like thermostatic elements 8 and 9. The outer member 9 is of such size that it is snugly slidable within the tube 2, and the inner tube 8 is similarly engaged in the tube 9 so that the adjacent inner and outer surfaces of the respective tubes are in close contact with each other to prevent entrance of foreign material therebetween and to effect conduction of heat from the generator through the tubular members. The inner member 8 is welded to the outer tube 9 at the inner ends thereof as indicated at 10. The opposite end of the inner member projects from the member 9 for mounting a fitting or head 11. The corresponding end of the outer member 9 also carries a flange 12 secured by welding, as indicated at 13 and 14.

The tubular members 8 and 9 are formed of materials having different coefficients of expansion. For example, the inner tube 8 may be formed of invar or other material having a low coefficient of expansion, while the outer tube 9 is formed of a material having a high coefficient of expansion, such as brass, so that when the tubes are subject to temperature change relative movement occurs therebetween for effecting actuation of a system of levers, later described.

The head or fitting 11 is illustrated as welded to the member 8 and includes a T having a clean-out branch 15 aligning with the axis of the inner tube and which is closed by a plug 16. The fitting also has a lateral branch 17 that is connected to the pipe 3 by a union 18. The fitting also has spaced lugs 19 and 20 forming a guideway 21 for a sliding block 22, later described.

23 designates a lever support or housing enclosing the fitting 11, and which has a wall 24 provided with an opening 25 through which the inner member 8 projects. The housing 23 also includes top and bottom walls 26—27, and side walls 28—29, the forward edges of which terminate in peripheral flanges 30 to which a cover plate 31 is attached by suitable fastening devices, such as screws 32. The bottom wall 27 has a slotted opening 33 to pass the branch 17 and to allow for expansion and contraction between the innermost member of the thermostat and the tube 2. The housing is secured to the flanges 5 and 12 by fastening devices 34. The fastening devices 34 have their shanks 35 extending through register-

ing openings in the respective flanges and into threaded sockets 36 as clearly shown in Fig. 1. A suitable gasket 37 is clamped between the flanges to provide a leak-proof joint.

Extending transversely and having support within bosses extending inwardly from the side walls 28 and 29 is a shaft 38 mounting a rock lever 39. The lever 39 has a depending arm 40 provided with a fork-shaped end 41 engaging over the sliding block 22, previously mentioned, the fork of the lever being connected with the block by a pin 41' extending therethrough. The rock lever also includes an upwardly extending arm 42 of longer length than the depending arm so that the free end moves through a greater arc responsive to movement of the thermostat, as later described. The arm 42 terminates in a head 43 which bears against the base 44 of a compounding lever 45, the lever being pivoted on a cross shaft 46, similar to the shaft 38, above described. The compound lever includes a relatively long depending arm 47 having a head 48 engaging against the end of a plunger 49, the plunger 49 being slidably mounted in a bushing 50, carried by the cover plate 31. It is thus obvious that shifting movement of the block 22 with the head 11 is multiplied through the system of levers so that the plunger 49 is caused to move a much greater distance. Vertical movement of the block in the guideway 21 compensates for arcuate movement of the lever without lost motion.

The plunger 49 may be utilized for actuating various devices, but is here illustrated as adapted for operating a rock lever 51 to effect closure of a valve 52, the rock lever 51 being pivoted on a suitable bracket 53 carried by the cover plate 31, the valve being also mounted on the cover plate and arranged so that the stem 54 thereof is adapted to be engaged by an adjusting screw 55 carried by the rock lever as clearly shown in Fig. 1.

With the structure thus described it is obvious that the lever support or housing 23 is fixed to the tube 2 and adapted to move therewith responsive to any expansion and contraction occurring therein with respect to the wall of the generator. It is further obvious that the flange 12 on the outer thermostat element is anchored to the flange 5 of the tube 2 so that the outer end of the tubular member 9 has fixed relation with the outer end of the tube 2. Therefore expansion and contraction occurring therein effect movement of the inner member 8 in the direction of the axis of the respective members. Since the housing and lever supporting shafts are carried by the tube 2, relative movement occurs between the housing and the head 11 to effect rocking movement of the lever 39 and the compounding lever 45 on their respective shafts to effect actuation of the plunger and rock lever 51 to operate the valve in suspending and permitting flow of fluid therethrough, for example, fuel supplied to the heating appliance of the generator.

From the foregoing it is obvious that the thermostatic tubes being in close sliding contact with each other and with the tube 2, there is no opportunity for entrance of foreign material that would tend to interfere with relative movement thereof or produce inaccurate movement by reason of any insulating effect of the accumulated foreign matter and that the heat within the gen-

erator acts directly through the walls of the respective tubes and is not blocked by calcium deposits or the like as there is, no room for such deposits between the respective tubes. Moreover, since the fluid passing through the tube 2 sweeps the inner surface of the inner thermostatic element, it is kept substantially free of deposits. The thermostatic elements are, therefore, subject to temperature of the gases of combustion flowing around and sweeping the tube 2 so that the resultant temperatures are effective in actuating the levers to open and close the valve or other operating mechanism to which the thermostat may be connected. It is also obvious that the construction of the thermostat avoids a false relative movement between the temperature responsive elements due to any foreign substance that might collect therein.

What I claim and desire to secure by Letters Patent is:

1. A thermostat mechanism for fluid heating devices having a heating chamber and a flow duct contained in said chamber in direct exposure to heating medium in said chamber including, lever carrying means exteriorly of said chamber, a lever pivoted on said carrying means, a rigid connection between the duct and said carrying means to bodily support said carrying means from said duct, and a plurality of telescoped tubes sieved within said duct with the outermost of said tubes rigidly anchored with respect to said carrying means and the innermost tube having free relative movement with respect to said carrying means and connected with said lever, said telescoped tubes having different coefficients of expansion from each other and being interconnected to provide relative movement between said tubes responsive to temperature of the heating medium acting upon said duct and modified by the temperature of fluid flowing from said duct through the innermost tube to produce said relative movement between the innermost tube and said carrying means for actuating said lever.

2. A thermostat mechanism for fluid heating devices having a heating chamber and a flow duct contained in said chamber in direct exposure to heating medium in said chamber including, lever carrying means exteriorly of said chamber, a lever pivoted on said carrying means, a rigid connection between the duct and said carrying means to bodily support said carrying means from said duct, a plurality of telescoped tubes having surface to surface contact with each other and sleeved within said duct with the outermost of said tubes in surface to surface contact with the duct, and means rigidly anchoring the outermost tube with respect to said carrying means, said innermost tube having connection with said lever and free relative movement with respect to said carrying means, said telescoped tubes having different coefficients of expansion from each other and being interconnected so that relative movement between said tubes responsive to temperature of the heating medium acting upon said duct and modified by the temperature of fluid flowing from said duct through the innermost tube produces said relative movement between the innermost tube and said carrying means for actuating said lever.

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