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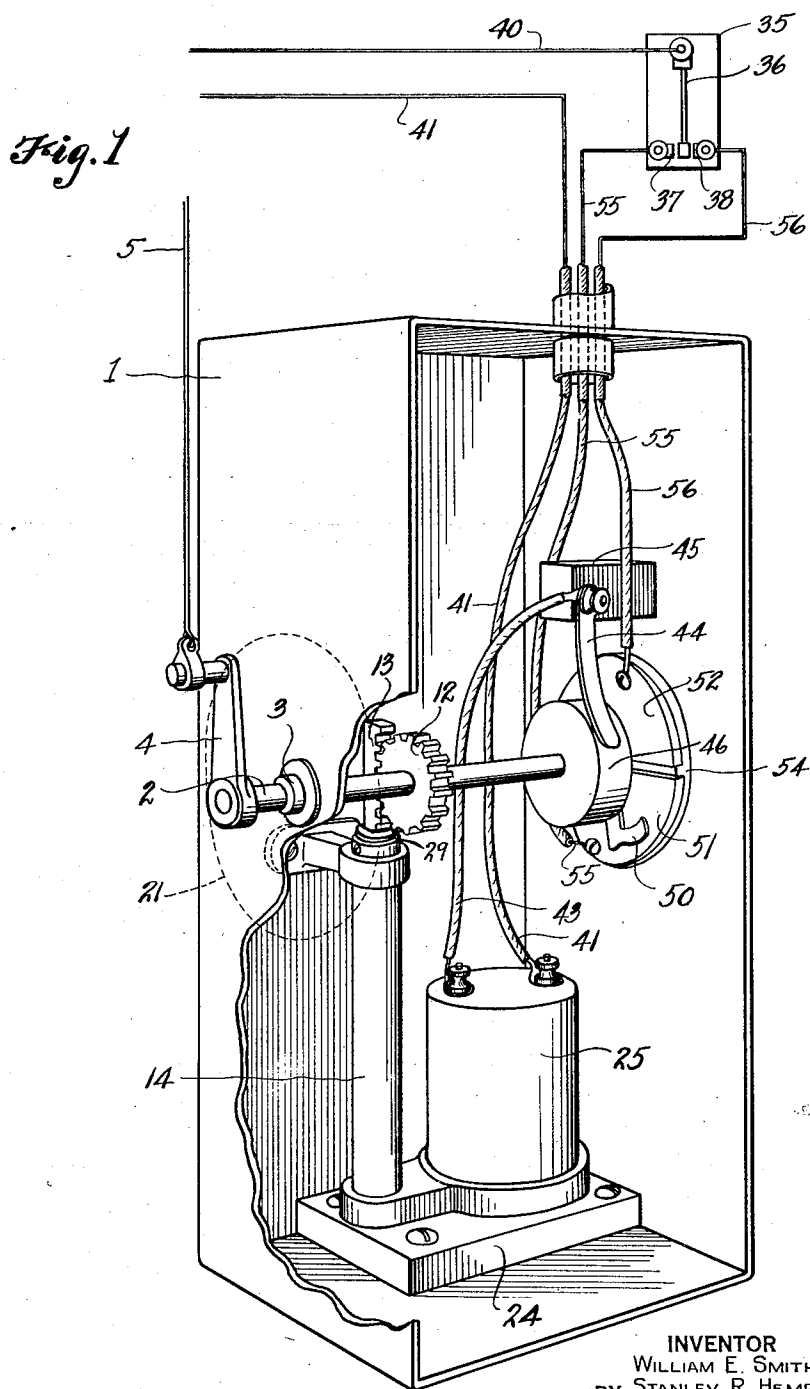
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THERMOSTATICALLY CONTROLLED MECHANISM

Filed Dec. 27, 1928

2 Sheets-Sheet 1



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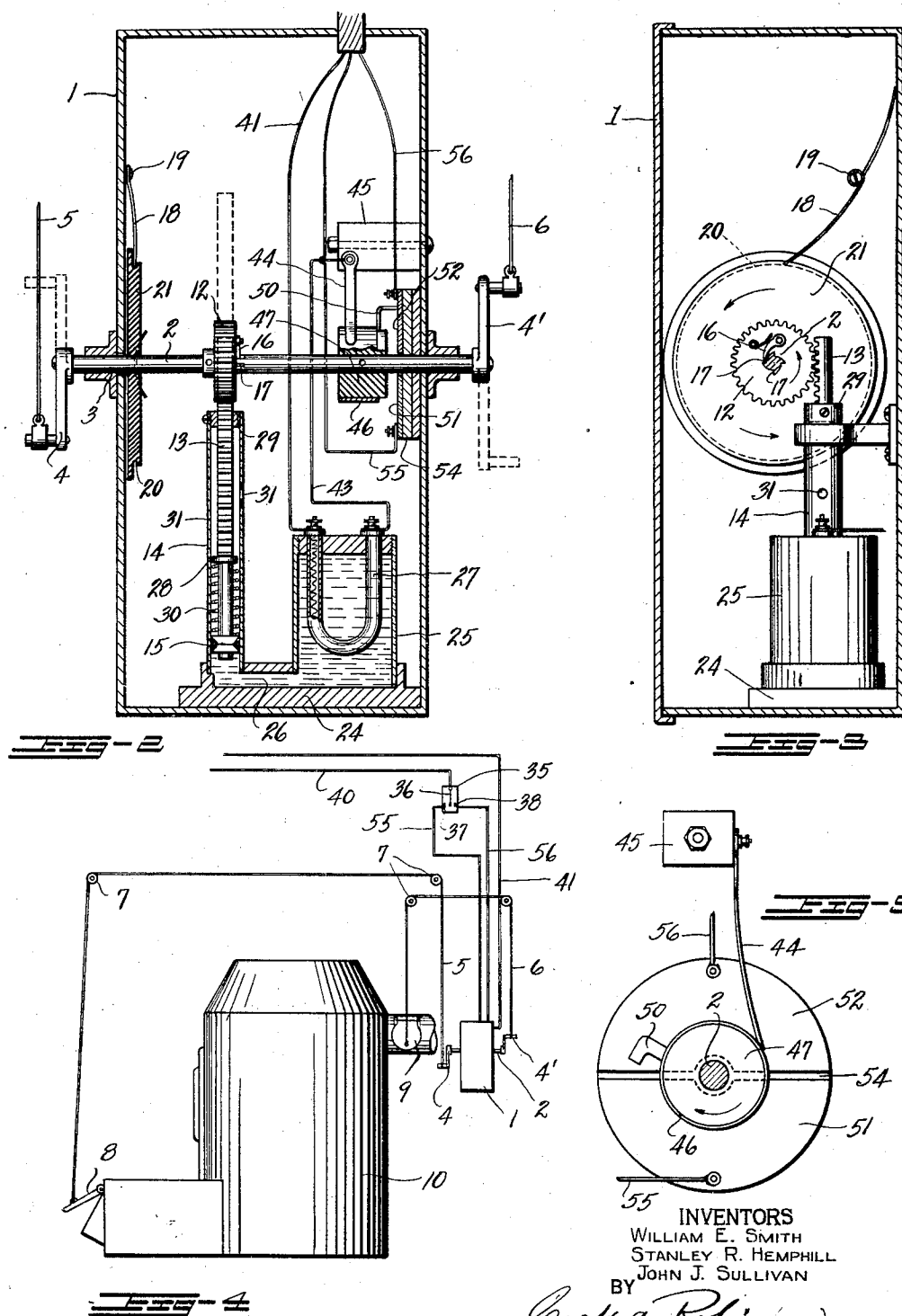
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THERMOSTATICALLY-CONTROLLED MECHANISM

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This invention relates to thermostatically controlled mechanism and has reference in particular to a mechanism of that character designed especially for controlling the opening and closing of the dampers of a furnace, stove, or burner, as a means of regulating the heat delivered therefrom.

It will be stated here that while in the following specification we have described the device only as used in connection with a furnace, it is not intended that the device be confined only to this particular use; it being readily apparent that the mechanism, in its present form, could be used just as well for other purposes. The present illustration, which shows the device as connected with the dampers of a furnace, has been selected principally for the reason that it well illustrates the use and operation of the device.

The principal object of the present invention is to provide a thermostatically controlled actuating mechanism which is relatively inexpensive, as compared with devices now generally in use for this purpose, which embodies no complicated mechanism, which is compact and durable, which is reliable in use and capable of exerting an unusual amount of power.

More specifically, the invention resides in the provision of a control mechanism that is operable incident to the generation of steam pressure within a closed vessel; the steam being generated by the closing of an electric circuit through a heating element contained within the vessel, and the circuit is under the control of a thermostatically actuated switch which operates automatically to close the circuit whenever the temperature within the area where the thermostat is located passes below or passes above certain predetermined limits.

Other objects of the invention reside in the various details of construction and in the combination of parts and in their mode of operation, as will hereinafter be described.

In accomplishing these objects, we have provided the improved details of construction, the preferred forms of which are il-

lustrated in the accompanying drawings, wherein—

Figure 1 is a perspective view of a mechanism embodying the present invention, the front panel of the housing and a part of the side wall thereof being removed for better illustration.

Figure 2 is a vertical section of the mechanism.

Figure 3 is a section taken substantially on the line 3—3 in Figure 2.

Figure 4 is an elevation of the device, showing diagrammatically the arrangement of the devices for actuating the draft and stack dampers of a furnace.

Figure 5 is an enlarged, face view of a part of the circuit switching mechanism.

Referring more in detail to the drawings—

In a preferred form of construction, the present actuating mechanism comprises an inclosing housing 1 within which the principal operating parts are contained and through which a horizontal shaft 2 is disposed; the shaft being rotatably mounted in supporting bearings 3 and is equipped, at its outer ends, with oppositely directed cranks 4 and 4' from which cables 5 and 6 extend over suitable guides 7, as shown in Figure 4, respectively to the hingedly mounted draft door 8 and the stack damper 9 of a furnace, designated at 10. The connections illustrated are such that when the draft door 8 is held in open position, the damper is permitted to close and each rotative movement of the shaft 2 through one-half a turn will reverse their positions.

Rotative movement of the shaft 2 is produced through a gear wheel 12 which is mounted on the shaft within the housing and in mesh with a vertically disposed rack bar 13. This bar is reciprocally contained within a vertically disposed cylinder 14 and, at the lower end of the bar, is a piston 15 mounted thereon and slidable within the cylinder.

A spring pressed latch, or pawl, 16 is pivotally fixed to the gear wheel 12, as shown in Figure 3, and is arranged so as to engage with notches 17 in the shaft so that when the gear is rotated by upward travel of the rack bar, 190

the shaft will be rotated accordingly, but on downward travel of the rack bar the gear will be permitted to rotate freely on the shaft. Any possible reverse movement of the shaft is prevented by use of a holding means consisting of a spring wire 18 which is fastened, as indicated at 19, to a side wall of the housing 1, as shown in Figure 3, and which bears at its end within a peripheral groove 20 formed in a fibre disk 21 that is fixed to the shaft. The end of the spring wire engages with the disk in such manner as to permit easy advance movement of the shaft but prevents any reverse movement.

The cylinder 14 is fixed, at its lower end, in a mounting block 24 which is fixed to the bottom wall of the housing 1. The block 24 also mounts a closed boiler 25, of cylindrical form, or which may be of any other suitable shape, and which contains a supply of water. The lower end of the vessel 25 has a communicating channel 26 leading therefrom into the lower end of the cylinder 14 and an electric heating element 27 is contained in the vessel 25 for heating the water as a means of generating steam. When steam is thus generated, it operates to force water from the vessel 25 into the lower end of the cylinder 14 to thereby force the piston 15 upwardly to move the rack bar accordingly and thereby cause rotation of the shaft 2. Upward travel of the rack bar is limited so as to advance the shaft only one-half a revolution, by means of a collar 28 that is fixed on the bar and which will engage with a plug 29 fitted over the upper end of the cylinder 14 and through which the rack slides.

As a matter of safety, the piston 15 is slidable on the lower end of the rack but is yieldingly held against movement relative thereto by the pressure of a spring 30 which is coiled about a bar between the piston and the collar 28. Should an excessive pressure be created within the cylinder, the spring will yield sufficiently after the collar 28 has engaged plug 29 that the piston may uncover an exhaust port 31 in the cylinder wall to permit the escape of water or steam and thereby relieve the excessive pressure.

Electric current for heating the elements 27 is delivered under the control of a thermostat 35 which, preferably, would be located in the area heated by the furnace. The thermostat may be one of the various kinds now used, but as here shown, consists of an arm 36 of thermostatic material which is fixed at one end and which has its other end disposed between spaced apart contacts 37 and 38. The device would be so adjusted that so long as a desired temperature was maintained the arm 36 would be free of both contacts 37 and 38, but should the temperature fall below a certain degree, the arm would be caused to move against the contact 37. If the temperature should pass above a certain degree, the

arm would be caused to move against the contact 38.

One side of the supply circuit is connected, by means of a wire 40, with the arm 36; the other side of the supply circuit is connected, by a wire 41, with one terminal of the heating element; the other terminal being connected by a wire 43 with a brush 44 that is mounted on a block of insulating material 45 fixed to the housing wall. This brush engages in rubbing contact with an electrically conductive band 46 that is mounted about a circular block or wheel 47 of non-conductive material that is fixed coaxially on the shaft 2. The band 46, in turn, has a brush 50 extending laterally therefrom for rubbing contact with semi-circular disks 51 and 52 which are arranged at opposite sides of the shaft 2 on an insulating base 54 that is fixed to the housing wall, and these disks, 51 and 52, are connected, respectively, by circuit wires 55 and 56 with the contacts 37 and 38.

Assuming the device to be arranged as illustrated in Figure 1, should the temperature become sufficiently low as to cause the arm 36 of the thermostat to engage with the contact 37, then a circuit will be closed from the source of electricity passing from the wire 40 through the arm 36, contact 37, wire 55, disk 51, brush 50, band 46, brush 44 and wire 43 to the heating element and return from the element through the wire 41. Heat generated by the element 27 produces steam within the vessel 25 and this steam forces water into the cylinder 14, thereby raising the rack bar 13 upwardly and causing the rotation of shaft 2 through a one-half turn. Rotation of the shaft through one-half a turn reverses the positions of the cranks 4 and 4' and thereby opens one of the dampers and closes the other. Rotation of the shaft 2 through one-half a turn also causes the brush 50 to move from contact with the disk 51 and into contact with the disk 52, thereby opening the circuit through the heating element. As the element cools off, the steam within the vessel 25 condenses, thereby tending to produce a vacuum and this draws the piston downwardly so that the rack bar again assumes its lowered position. Downward movement of the rack bar does not, however, effect rotation of the shaft 2, as was previously pointed out.

When the device is used in connection with a furnace, as shown in Figure 4, opening of the door 8 and closing of the damper 9 increases the draft to the furnace and thereby causes more heat to be delivered from the furnace. Accordingly, the temperature of the room within which the thermostat is contained would rise and the arm 36 would engage the contact 38. This would cause the closing of the circuit through the heating element and a second generation of steam for again actuating the rack bar upwardly to rotate the shaft through one-half a turn.

Thus, the positions of the dampers would be reversed and the heat delivered would be diminished.

It is readily apparent that rotative movement of the shaft 2 could be controlled by the length of travel of the rack bar and also by size of gear 12 used. Also, that rotative movement of the shaft could be made to accomplish various results other than that here shown. It is also quite apparent that various details of construction could be changed without departing from the spirit of the invention.

Having thus described our invention, what we claim as new therein and desire to secure by Letters Patent, is:

1. A mechanism of the character described comprising in combination, a water containing boiler, a heating element for the boiler, a thermostat for automatically controlling functioning of the heating element for the creation of steam pressure therein, a cylinder connected to receive pressure from the boiler, a piston adapted to be actuated outwardly within the cylinder incident to creation of pressure in the boiler, a rack connected with the piston, a rotatably mounted control shaft and an actuating gear on said shaft meshing with the rack.

2. In a mechanism of the character described comprising in combination, a water containing boiler, a heating element for the boiler for the creation of steam pressure therein, means for controlling functioning of the heating element, a cylinder connected to receive pressure from the boiler, a piston in the cylinder adapted to be actuated outwardly therein by pressure created in the boiler and to be moved inwardly incident to vacuum created by condensation of steam in the boiler, a rack bar fixed to move with the piston, a rotatably mounted shaft, a gear rotatable on the shaft and meshing with the rack, means whereby the shaft is caused to be rotatably advanced by the gear when driven by outward travel of the piston, a brake for preventing reverse rotation of the shaft and a mechanism actuating crank on said shaft.

3. A device as in claim 2 wherein the inward and outward limits of travel of the piston in the cylinder are controlled so as to limit the arc of advance rotation of the said shaft.

4. In a mechanism of the character described, in combination, a water containing boiler, a heating element for the boiler for the creation of pressure therein, means for controlling the functioning of the heating element, a cylinder connected with the boiler to receive pressure therefrom, a piston operable outwardly and inwardly in the cylinder incident to the creation of and relieving of pressure in the boiler, a rack bar connected to move with the piston, means for limiting its outward movement, a rotatably mounted shaft, a gear on the shaft meshing with the rack and means connecting the gear with the

shaft through which the shaft is rotatably advanced only by each outward movement of the piston, and a damper control device connected with the shaft.

5. A device as in claim 4 wherein the piston is slidable on the rack bar but held at a certain position thereon by a yieldable means, and wherein the cylinder wall has a pressure relief port therein at a point above normal travel of the piston but adapted to be uncovered incident to creation of abnormal pressure against the piston by virtue of said yieldable means.

6. In a device of the character described, a water containing boiler, an electric heating element for the boiler for the creation of pressure therein, a cylinder connected to receive pressure from the boiler, a piston operable outwardly and inwardly in the cylinder incident to creation of and relief of pressure in the boiler, a rotatably mounted shaft, a gear on the shaft, a rack connected with the piston and operable in mesh with the gear to rotatably advance the shaft one-half turn with each outward movement of the piston, a brush movable with the shaft, a pair of contacts adapted to be alternately engaged by the brush with successive advance movements of the shaft, a thermostat comprising an arm movable in opposite directions incident to changes of temperatures upward or downward from a certain range of degrees, a pair of contacts adapted to be engaged by the arm at predetermined degrees of temperature, an electric circuit having one side connected to said arm of the thermostat and its opposite side connected to one terminal of the heating element, a circuit connection between the other terminal of the heating element and said brush and connections, respectively, from the said spaced contacts of the thermostat to the pair of contacts that are engageable by the brush.

Signed at Seattle, Washington, this 20th day of December, 1928.

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