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R. J. DOUGHERTY

2,348,965

THERMOSTATICALLY OPERATIVE VALVE

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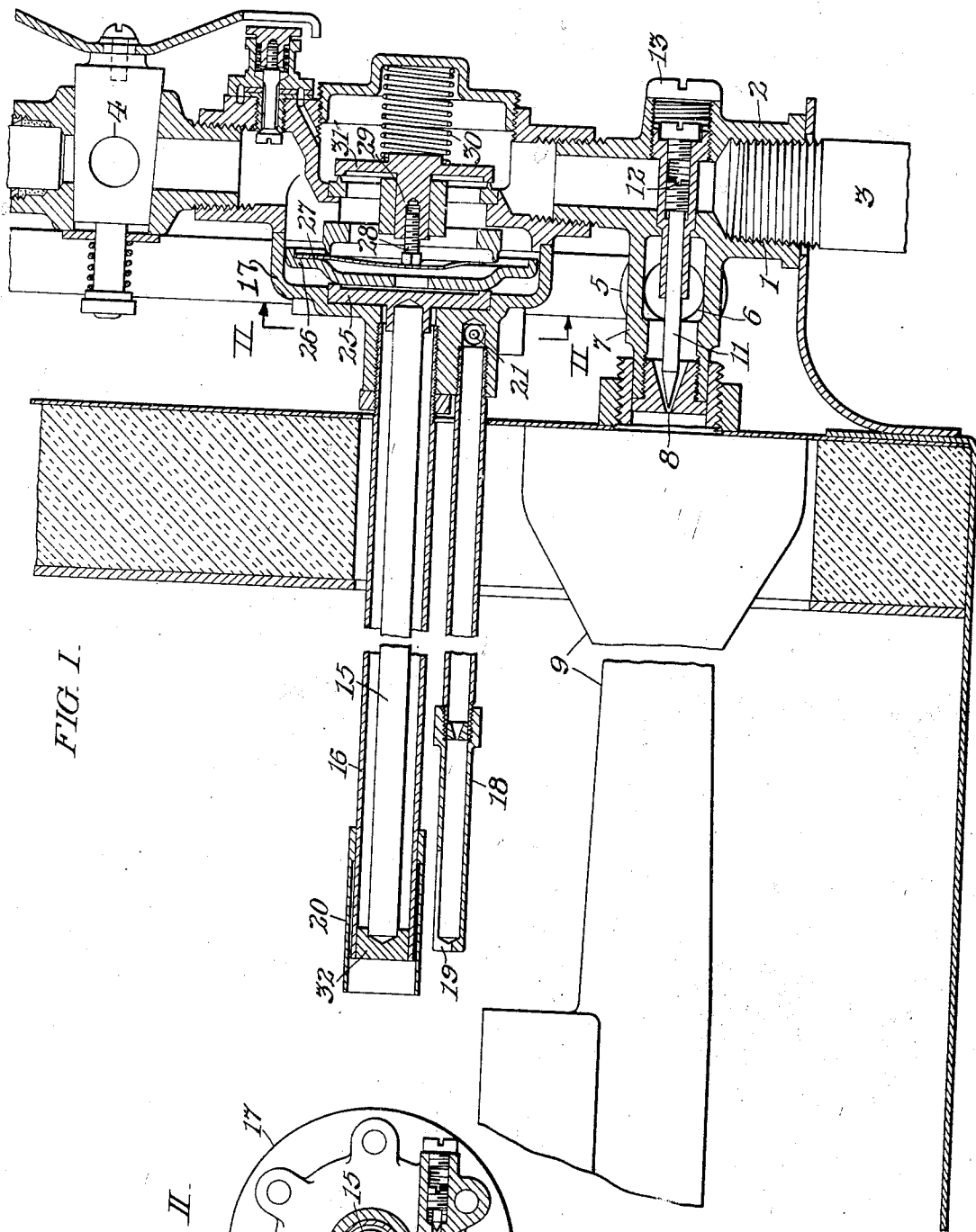


FIG. I.

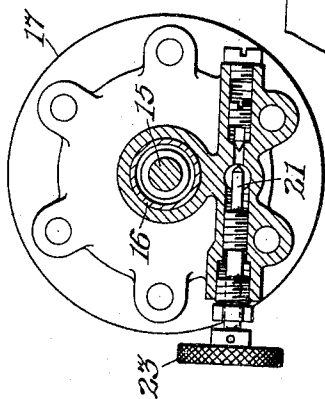


FIG. II.

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UNITED STATES PATENT OFFICE

2,348,965

THERMOSTATICALLY OPERATIVE VALVE

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Application December 10, 1940, Serial No. 369,455

1 Claim. (Cl. 158—117.1)

My invention relates to valves of the general class disclosed in Letters Patent of the United States No. 1,974,646 and No. 1,963,043 which may be advantageously employed in controlling the flow of gas to a burner which is part of a water heater. In each of the patented structures, the members of the thermostatic couple are formed of respectively different material, viz., a copper tube which has a high coefficient of expansion, and a rod of the ferrous alloy known as "invar"; the coefficient of expansion of the latter being negligible within the range of temperatures to which the couple is subjected. On the contrary, in accordance with my present invention the members of the thermostatic couple are formed of the same material, preferably of non-corrosive steel. Consequently, relative movements of the members of the couple are effected solely by the degrees of temperature to which the members of the couple are respectively subjected, without any differential due to differences of coefficients of expansion.

The principal advantage of my invention is that full opening or closure of the valve is instantaneously effected with snap action and with considerably less difference in the time for opening and closing than in said structures of the prior art. For example, in my improved structure the valve will close in slightly more than thirty seconds upon extinguishment of the gas flames of the pilot burner, as compared with a five-minute time interval required by most of the prior art devices.

My invention includes the various novel features of construction, arrangement, and method of operation hereinafter more definitely specified.

In said drawing; Fig. I is a fragmentary vertical sectional view of a gas fired water heater conveniently embodying my invention.

Fig. II is a vertical sectional view taken on the lines II, II in Fig. I and showing a face view of the casing in which is mounted the snap spring and needle valve for controlling the pilot burner.

Referring to Fig. I; the gas inlet 1 in the fitting 2 may be connected to any convenient source of gas supply, conveniently by the pipe 3. The manually operative shut-off valve 4 controls the flow of gas to another thermostatically operative valve, for example such as shown in Letters Patent No. 1,974,646, conveniently located in the upper portion of the water container of the heater, which functions to prevent heating the water beyond a predetermined limit for which that valve is set. The pipe 5 extends from that

valve down to the port 6 in the needle valve casing 7 from which gas is delivered through the orifice 8 into the main burner 9 under control of the manually adjustable needle valve 11. Said needle valve has the slotted head 12 to effect its adjustment and it is normally secluded in the fitting 2 by the removable screw plug 13.

The thermostatic couple comprising the rod member 15 extending within and shielded by the other coupling member 16 which is a tube, is supported in horizontal position by connection with the snap spring casing 17 which also supports the pilot burner tube 18 parallel therewith. Said pilot tube 18 is connected by suitable piping in the well known manner directly to the gas supply pipe, so that gas is supplied continuously to said pilot tube 18. Said pilot burner 18 has the flame jet orifice 19 at its left hand end beneath said tubular member 16 of the thermostatic couple and the inner end of said tube 16 is shielded by the sleeve 20 overhanging the flame orifice 19 of the pilot burner. The supply of gas to the pilot burner may be precisely regulated and controlled by the needle valve 21 which may be turned by the knob 23 shown in Fig. II.

The right hand end of the rod 15 shown in Fig. I is seated in the thrust disk 25 which bears upon the supporting plate 26 which engages the perimeter of the snap spring 27 which, when the device is cold, is in the concave position shown in Fig. I. The adjusting screw 28 carried by the plunger 29 is continually stressed toward the rod by the spring 30 in said casing 17 but, when cold, the valve 31 is closed.

When heat is applied by the flame of the pilot burner, at orifice 19, the tube 16 expands; pressure on the rod 15 is lessened and when the temperature difference between the tube and the rod has reached a certain point the snap spring 27 will snap to the reverse position, opening the valve 31. Gas is then permitted to pass through the shut-off valve 4 and back through the pipe 5, when the valve 4 is opened, and the pilot burner 18 will light the main burner 9 if the thermostat is calling for heat.

Should the flame at the pilot burner orifice 19 be extinguished; the tube 16 will begin to cool first, but the rod 15 will retain whatever temperature it has reached for a longer period, hastening the closure of the safety shut-off valve 31. There can be no critical danger point because the rod 15 remains slightly warmer than the tube 16 during the entire cooling off period.

The sleeve 20 at the inner end of said tube 16

shields it from the direct pilot flame; thereby preventing the heat from reaching the plug 32 and transferring heat to the rod 15. Said sleeve also carries the heat directly to the main expanding portion of the tube 16.

I do not desire to limit myself to the precise details of construction, arrangement or method of operation herein set forth, as it is obvious that various modifications may be made therein without departing from the essential features of my invention as defined in the appended claim.

I claim:

In thermostatically operative valves for heating means including a main gas burner; the combination of a valve controlling the supply of gas to said main burner; a spring tending to move said valve to closed position; a pilot burner, having a flame orifice, for said main burner; a thermostatic couple composed entirely of the same material in operating relation to said valve and said pilot burner; one member of said couple being a rod and the other member of said couple being a tube completely enclosing said

rod; a sleeve mounted at one end of said tubular member and interposed between said tubular member and the flame orifice of said pilot burner; said sleeve being fastened at one end to said tube and opened at its opposite end; and a snap spring between said rod of said thermostatic couple and said valve, and in operating relation to both said valve and said rod of said thermostatic couple; whereby movement of said rod in a direction away from said valve caused by expansion of the tube of said thermostatic couple when said pilot burner is lighted will permit said snap action spring to snap to convex position to move said valve to open position; and movement of said rod in a direction toward said valve caused by contraction of the tube of said thermostatic couple when said pilot burner is extinguished will cause said snap spring to snap to concave position away from said valve and permit said valve to be moved to closed position by its spring.

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