

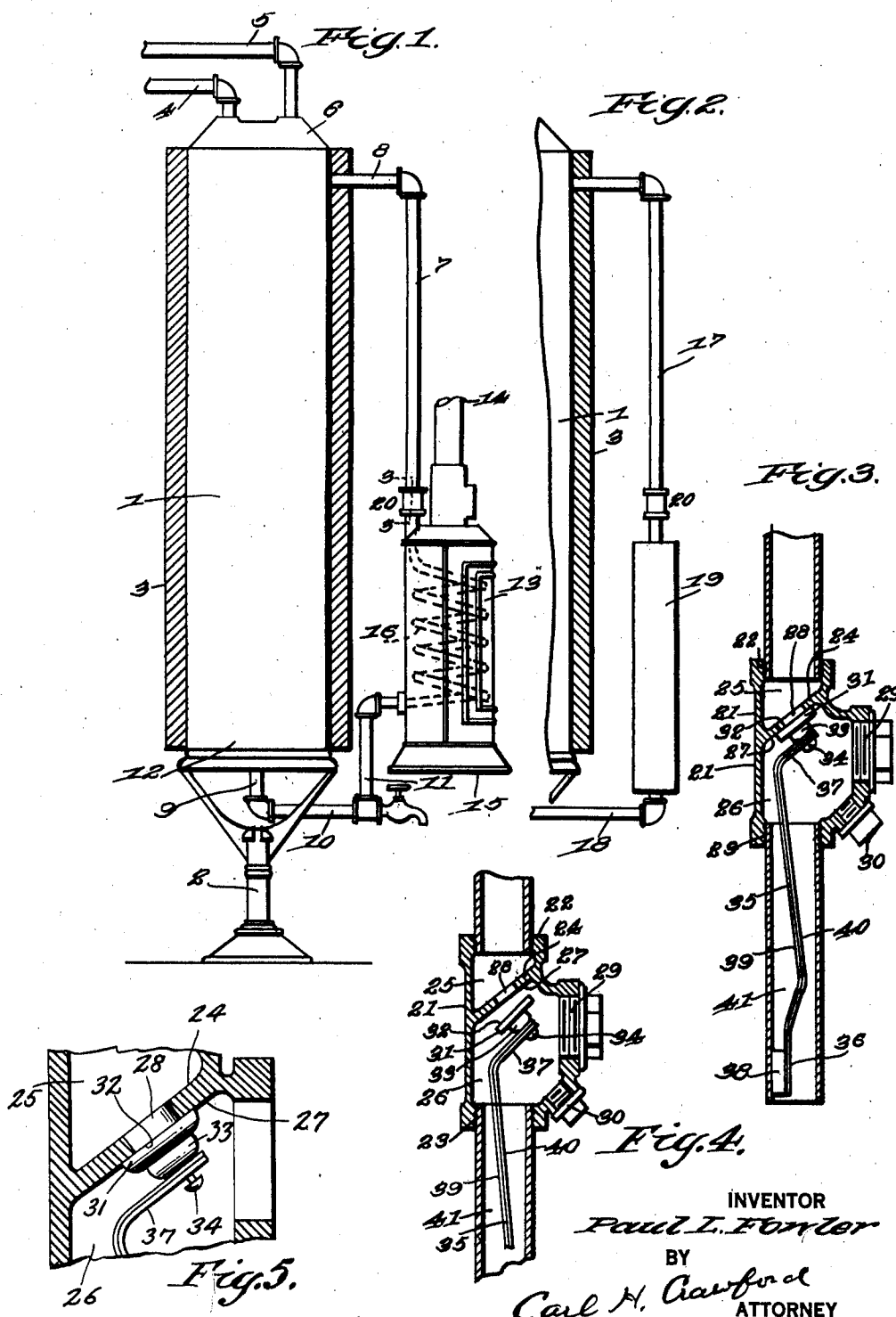
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BY-PASS VALVE STRUCTURE

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BY-PASS VALVE STRUCTURE.

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This invention relates to improvements in by-pass valve structures and one of the primary objects is to provide a novel means of controlling circulation of the water in the by-pass pipe of range boilers.

A range boiler, primarily for domestic use, now consists of a tank having a cold water inlet and a hot water draw-off, and a circulating by-pass pipe with the ends thereof connected near the upper and lower ends of the tank, respectively. In order to provide hot water quickly, gas or electric circulating heaters are interposed in the by-pass pipe and are started and turned off in accordance with hot water requirements. When the heater is not operating, especially if it is a gas heater, but also in the case of an electric heater, a very rapid and costly amount of radiation takes place throughout the length of the by-pass pipe and heater and the hot water in the tank backs downwardly through the by-pass pipe and heater and is cooled and enters the bottom of the tank. Even if the heater is automatically regulated, this is true, and the loss is great, because even in practical absence of draw-off from the tank of hot water, the heater is started to re-heat the water that has been cooled by back circulation in the by-pass pipe, and consequently, the consumption of gas or current is needlessly increased over what should be necessarily used.

Now it is one of the primary objects of this invention to provide means automatically acting to arrest and halt back circulation in the by-pass pipe after a heater has either been manually or automatically shut off.

A further object is to automatically open the by-pass pipe for ascension of hot water therein toward the top of the tank just as soon as the circulation heater has been either manually or automatically started.

The invention will be more fully described in connection with the accompanying drawing and will be more particularly pointed out in and by the appended claims.

In the drawing:—

Fig. 1, is a view in side elevation of a range boiler with heat insulation in section and showing the boiler equipped with a circulation by-pass pipe in which is interposed a gas heater, as well as the device of my invention.

Fig. 2, is a fragmentary view illustrating the adaptability of my invention where an electric circulation heater is used.

Fig. 3, is an enlarged sectional view on line 3—3 of Fig. 1, showing more particularly that portion of the combination constituting the device of my invention as an article of manufacture, and showing the closure seated.

Fig. 4, is a similar view showing the closure unseated.

Fig. 5, is an enlarged sectional view showing the closure seated and illustrating the loose play resulting from the screw head being in spaced relation to the thermostatic strip.

Like characters of reference designate similar parts throughout the different figures of the drawing.

As shown, the tank is designated at 1 and is mounted on a pedestal 2, a jacket being shown at 3. A cold water supply pipe 4, and a hot water draw-off pipe 5, are shown connected with the top 6, of the tank. A circulation by-pass pipe consists of upper sections 7 and 8, the latter being connected with tank 1, near the top thereof. Lower sections 9, 10 and 11, of the by-pass pipe are shown with section 9, connected at the bottom 12, of tank 1. A usual type of gas heater 13, having a vent 14, and a lower open end 15, is provided with the usual coil 16, shown in dotted lines, and this coil is usually of copper because of its known advantages for this purpose. The lower convolution of coil 16 is connected with section 11, of the by-pass pipe and the upper convolution is connected with section 7, so that as the water is heated, it will ascend in section 7, into tank 1, because of the reduced weight of hot water with respect to cool water. As the hot water ascends in section 7, the cooler water in the bottom of the tank will enter coil 16, in the well known manner.

Some of these gas heaters are automatically controlled by thermostatic or other devices disposed in operative relation to tank 1, to start and stop or reduce the heat, in accordance with usage of hot water and radiation. Others, are manually controlled. However, in either event, the copper coil 16, and the entire length of the by-pass pipe, the latter being usually not insulated, serve quickly to cool the water contained therein. The draft up the open bottom 15, and through vent pipe 14, greatly hastens the rapidity of radiation. As an inevitable consequence, the hot water backs downwardly in the by-pass from the top of tank

1, and a constant cooling action of this character quickly reduces the temperature of the water in tank 1.

The same is true with the construction shown in Fig. 2, wherein the sections 17 and 18 of the by-pass are connected up with an electric circulation heater 19, although the radiation loss is not quite so great due to the absence of the copper coil 16.

I will next refer to Figs. 3 and 4, and will explain the structure and interdependent relation of the device of my invention in the combination heretofore set forth.

The device, generally indicated at 20, as shown, consists of a valve casing 21 having internally threaded ends 22 and 23, so that the casing can be interposed in the by-pass pipe, and in the form shown, I have disposed the valve above and adjacent the heater. The interior of casing 21 is divided by a diaphragm 24, into chambers 25 and 26. This diaphragm has a flat and substantially downwardly facing valve seat 27, and an opening 28, is centrally disposed with respect to said flat seat. The casing shown, is provided with an inspection plug 29, and a plug 30, which latter serves a useful purpose in assembly of the device. A valve closure is indicated at 31, the same having a flat and substantially upwardly facing seating face 32, adapted to engage seat 27, to close off passage of water through the valve. Otherwise, the valve closure 31, is free from any connection with casing 21, either in the form of a guiding or mechanical connection and hence the closure may be termed a "floating closure" by reason of the fact that, as will later appear, its seating and unseating movements are not of a fixed and predetermined order. The valve closure 31, is shown provided with a protuberance 33 which is suitably drilled and threaded to take a screw 34.

Reference will next be made to the means for operating said valve closure.

As shown, said means consists of a thermostatic strip of metal having an intermediate section 35, an anchoring section 36, and a valve closure section 37. The section 36, is shown anchored to the interior of the by-pass pipe at 38, in any desired manner. The section 37, is loosely secured to closure 31, not rigidly, by screw 34, but so that the closure 31 cannot move or be moved except by thermostatic action of the strip. In Fig. 5, I have shown a clearance between the protuberance 33 and the head of screw 34, to afford the required loose play. This strip, while it is formed or rolled in one piece, may consist of two pieces of metal, one, designated at 39 having the higher relative coefficient of expansion, and the other, 40, having a lower relative coefficient of expansion. From this disclosure, it will be clear, that when hot water rises from the heater

into chamber 41, the thermostatic strip is "set" and arranged to unseat closure 31 and permit the hot water to freely ascend to tank 1. When the water in chamber 41 cools, the thermostatic strip will seat closure 31, thereby halting circulation in the by-pass pipe and preventing hot water from tank 1, from backing downwardly in the by-pass pipe. Thus it will be seen that the thermostatic strip contracts substantially in the direction of its length to unseat the closure 31, and expands, substantially in the direction of its length to seat said closure. It will be seen that the closure 31, opens substantially downwardly, which is against the gentle upward movement of hot water in the by-pass, but it is understood that the pressure on both sides of closure 31 is so nearly equal that any differential of pressure is nugatory, as far as the practical operation of my invention is concerned. My invention is designed to be applied in just such a case where the difference of pressure on opposite sides of the controlling valve is not appreciable, in a practical device and could not be determined except with laboratory or scientific instruments.

It will also be noted that between the point of anchorage to the pipe and closure, the thermostatic strip is free from contact or engagement with any structure either when the closure is seated or unseated, and that the strip is located not only in the path of water with the freest exposure of its area thereto, but it is also located in close adjacency above the heater so as to be very quickly responsive to the hot water rising therefrom.

While the device of my invention, as shown, is not a non-return valve in form, in the sense that it automatically closes as a result of water flowing or moving against closure 31, still, in function, it serves the purpose of a non-return or check valve.

The screw 34, in practice, is not turned home tightly, and there will in actual use be sufficient play at the connection of the closure 31 with the thermostatic strip to cause the upper end of the latter to fulcrum against protuberance 33, in closing or seating movement so that the closure 31 will be able to engage the valve seat in an annular abutting contact that will be amply sufficient to arrest the very gentle tendency of cooled water to back down the by-pass pipe. It will be understood that it is not necessary to provide an engaging contact of the closure with the valve seat such as would render the seating water tight, as such a slight amount of leakage as might occur with a metal to metal valve fit, under light closing thrust, would not amount to anything, hence, I do not provide any packing gasket between the valve seat and closure.

While I have herein shown and described

one specific form of my invention, I do not wish to be limited thereto except for such limitations as the claim may import.

I claim:—

5 A circulation controlling by-pass valve structure, comprising, a substantially vertically disposed hot water circulation by-pass pipe, a valve interposed in a vertical portion of said pipe, a floating closure for
10 said valve opening downwardly and closing upwardly therein, and a thermostatic strip in said valve having its upper end loosely connected with said closure and its lower

end anchored in said pipe, and said thermostatic strip being constructed to length- 15
wise contract to un-seat said closure downwardly against ascending water when the latter is relatively hot and substantially
lengthwise expand to seat said closure up-
wardly against descending water when the 20
temperature of the latter is relatively cold, thereby preventing hot water from backing downwardly in said pipe.

In testimony that I claim the foregoing as my own, I hereby affix my signature.

PAUL L. FOWLER.