

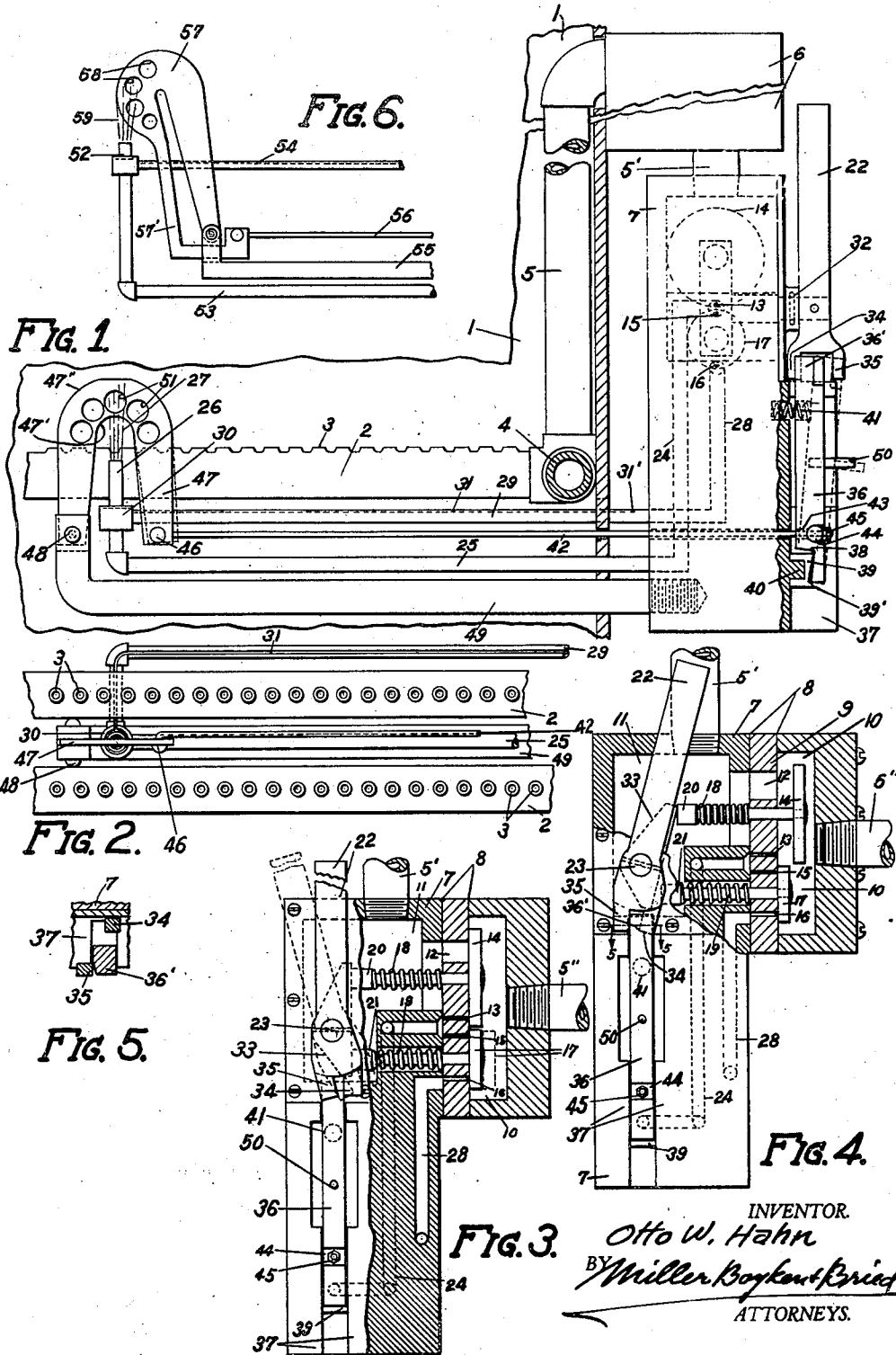
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THERMOSTATIC FUEL CONTROL

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THERMOSTATIC FUEL CONTROL

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This invention relates to thermostatic control of fluid fuel supply to burners, particularly fuel gas supply, and has for its objects improved mechanism of this character which will operate directly upon the fuel valve mechanism without the interposition of electric devices, also such mechanism which will be absolutely fool-proof and will hold the main fuel valve closed when no pilot flame is burning. Also a construction of the heat responsive element which will develop considerable movement and mechanical power in heating and cooling, and insure such operation for years. Other objects and advantages of the invention will appear in the following description and accompanying drawing.

In the drawing Fig. 1 is a side elevation, partly in section, showing my improved thermostatic control apparatus on a gas burner.

Fig. 2 is a plan view of the left-hand portion of Fig. 1.

Fig. 3 is an end view of the right-hand end of Fig. 1, partly in section, and showing the gas valves closed.

Fig. 4 is a view similar to that of Fig. 3 but showing the main burner gas valve and pilot gas feed open.

Fig. 5 is a fragmentary section of Fig. 4 as seen from the line 5—5 thereof.

Fig. 6 is a side elevation showing a modification in the form of the heat responsive element.

In further detail the drawing shows a portion of a stove or fire box 1 of any desired heating equipment and within which is one or more gas burners 2 taking the form of pipes with a row of holes 3 on top. These pipes 2 may join a transversely extending header or manifold 4 from which any number of burner pipes may extend. The burner may take any other form than a straight pipe. Gas is supplied to the header by a supply pipe 5 leading from a box 6 which may contain any desired thermostatic or other automatic control, not shown, for raising, lowering, or extinguishing the flame to suit the heating requirements and from which box the supply pipe 5' extends to a valve housing 7 forming part of the present invention, and which housing is made separable along the lines 8 and is provided with a vertical wall 9 forming an outer, 10, and an inner, 11, gas chamber ported through the wall by ports 12, 13, closed or opened simultaneously by a spring-actuated valve 14, and ports 15 and 16 closed or opened simultaneously by a spring-actuated valve 17, the springs of the valves being shown respectively at 18 and 19 surrounding the respective valve rods which are fitted with heads 20, 21 for opening the valves by a rocking cam lever 22 pivoted at 23 to the valve housing, all as will be later explained.

Port 12 leads from the receiving gas chamber

10 through chamber 11 to the main burner supply pipe 5' and port 13 leads by way of a passageway 24 to a pilot flame gas supply pipe 25 at the outer end of which is a vertically directed pilot flame burner 26 from the upper end of which a pilot flame 27 is adapted to burn.

Port 13 for supplying the pilot is under control of valve 14 and must open when the main burner port 12 opens, but besides port 13 there is another port, 15, for also supplying the pilot when valve 17 is open, as this port 15 also leads directly to passageway 24. Port 16 also controlled by valve 17 leads to a passageway 28 which supplies gas to a small horizontally extending pipe 29 which is openly slotted along its upper surface and leads to a ring-like burner 30 around the pilot so that when a flame burns from the ring 30 it will always be in a position to ignite the pilot when the pilot gas is turned on.

The slot 31 in the pipe extends from the ring burner 30 to a point as at 31' outside of the stove or fire box 1 so that when the gas is admitted to passage 28 and pipe 29 it may be ignited by a match at 31' and will travel at once along the slot to the ring burner 30 and light the pilot, for the pilot gas will also be flowing in pipe 25 as both ports 15 and 16 are simultaneously uncovered by valve 17.

Means is provided for manually opening valves 14 and 17 in the rocking lever 22, the pivot pin 23 of which is secured to the lever to rock with it and which pin passes into the valve housing 7 through a packing hub 32 and carries a cam or block 33 which is fast on the pin and so shaped that upon right-hand moving of lever 22 it will contact head 20 of the stem of valve 14 to open the valve against the spring (as shown in Fig. 4) and when rocked to the left it will permit this valve to close but will then open valve 17 (to the dotted position shown in Fig. 3), and when the handle stands vertical both valves will be closed.

This rocking lever 22 is bifurcated at its lower end to form a pair of jaws or lugs, 34 and 35, lug 34 being herein termed the inner lug and lug 35 the outer lug. The lugs are spaced apart on the handle a sufficient distance to pass the upper end 36' of a latch 36 which is mounted in such a way that it may be moved inwardly and outwardly so as to get into the path of either lug 50 of the handle and thereby stop it from moving in that direction.

The latch 36 is a vertically arranged bar positioned freely in an open slot formed by extending walls 37 on the housing 7 and the lower end of the latch bar is notched or stepped as at 38 to rest upon and fulcrum against a fulcrum block 39 shown here as a U-shaped device (of good steel) positioned over a projection 40 of the valve housing between the walls 37. This latch 60

bar is resiliently pushed outward at its upper end by a compression spring 41 recessed into both valve housing as well as the latch (see Fig. 1), and retained in place against the thrust of this spring by a horizontally extending rod 42 which passes freely through a hole 43 in the latch and through a round pin 44 seated in a notch in the outer side of the latch bar and has an adjusting nut or nuts 45 at its outer end. The opposite end of the rod 42 is pivotally connected at 46 with the end of one leg of an inverted U-shaped heat responsive element 47 which arches over the pilot light flame and pivotally anchors at 48 at the end of its other leg to a supporting bar 49 which extends rigidly into the fire box from the valve housing. The arrangement being such that as the horseshoe-shaped device 47 opens and closes it will pull or push a rod 42 to thereby either pull the latch 36 inwardly or permit it to swing outwardly under influence of spring 41.

Latch 36 is, however, always free to be manually pushed inwardly due to the open notch in which pin 44 is seated, and to this end is provided with a finger piece or push button 50.

It will be noted from Fig. 1 that in the position shown the latch fulcrums on the upper corner of block 39 very close to the connection of rod 42 so that a slight movement of rod 42 in an axial direction will result in a relatively large movement of the upper or active end of the latch, but in moving outward the step portion 38 of the latch changes its fulcrum point from the upper corner of block 39 to the lower corner where a small tit 39' projects to help hold the latch in proper position and thus the fulcrum point being shifted further from rod 42 the movement of the latch becomes less with a given movement of the rod, but takes place under greater pressure.

The heat responsive member 47 is of flat chrome nickel steel of horseshoe shape with heavy elongated arms, as shown, and has a curved row of round holes 51 through it nearer to the inner arched line of the horseshoe so as to connect the inner, 47', and outer, 47'', curved portions with metal spokes and thereby reduce the heat conductivity between these two portions so that the pilot flame 27 in the position shown will maintain the inner arched portion 47' at about a low red heat.

In the showing of Fig. 6 the pilot is shown at 52, its gas feed pipe 53, the slotted lighter tube 54, fixed supporting bar 55, latch-operating rod 56, all of the same construction as described for Fig. 1, but the heat responsive member here numbered 57 is somewhat modified in form in having the circular row of holes 58 around one side of the largest or outer arch, and the pilot flame 59 is arranged to give its maximum heat to the outer arch section. The upwardly extending end of the supporting bar 55 is slotted for free passage of a horizontally extending portion of the movable arm 57' of the horseshoe which connects to the latch operating rod 56.

The form and material of the heat responsive element were developed after exhaustive experiments with various steels and other metals as well as bimetallic constructions, and as a final result the shape with a circular head portion pierced near one edge with a row of holes was found superior to others in yielding great power and stability, and the particular metal chosen is a chrome nickel steel containing about 18% chromium and 10% nickel, as this was found to combine a very high scaling point with great resist-

ance to corrosion, a high expansion coefficient, and a practically complete and quick reversal cycle maintained through a period of years at a temperature of 1500° Fahrenheit.

It was found that with the horseshoe shape of heat responsive element chosen, a substantially uniform heat applied even up to a dull red heat had practically no effect on the latch control, for such application of heat caused a uniform linear expansion of the element with substantially no outward or leverage movement of the arms, and hence if the pilot flame becomes accidentally extinguished the latch rod 42 will be at once retracted even with the full radiant heat from the main burners or heated fire box of a furnace in which it may be installed, playing freely upon the member, and this will result in the latch 36 being withdrawn from the path of outer lug 35 of lever 22 so that it will permit valve 14 to close under energy of its spring 18 and thereby close both pilot port 13 and main burner port 12 and extinguish both flames. Continued retraction of the rod 42 will pull latch 36 to position in the path of inner lug 34 so that lever 22 could not be swung to the right (as in Fig. 4) to open the main burner valve 14, but would be freed for swinging in the opposite direction (to the left as per dotted lines in Fig. 3) to thereby cause cam or block 33 to impinge valve stem head 21 and open valve 17 (to the dotted position in this figure). The handle 22 would, however, not stay in this position but would fly right back to neutral position (with both valves closed) unless held in open position for valve 17 and a match touched to the slotted pipe at 31' which will instantly shoot a flame along this pipe to the ring burner 47 and thereby light the pilot also being supplied with gas by the opening of valve 17, and the moment the pilot ignites the element 47 expands and releases latch 36 so that it is pushed out under force of spring 41 until it touches the inner face of outer lug 35 which then will overlie it as indicated in Fig. 3, and since this will remove the latch from the path of the inner lug 34 the lever will be freed to swing to the right for opening the main burner valve 14 as in Fig. 4. This means that the slotted igniter pipe feeder port 16 will be shut off as well as the pilot flame port 16, and hence the slotted igniter pipe and ring burner flame will go out, but the pilot flame will not go out as the other pilot feeding port 13 is opened so quickly that the residual gas within the pilot flame pipe 25 will tide over this brief instant. As soon as lever 22 is swung to the right to open the main burner feed and pilot feed 13 latch 36 snaps outward in the path of lug 35 (as in Fig. 4) to lock the hand lever in this position.

If at any time it was desired to extinguish both the main burner and pilot, button 50 may be pushed to force latch against spring 41 until the latch strikes the outer face of lug 34 (which lies just behind the latch as shown by the dotted position of this lug in Fig. 4) and lies in the free path between the two lugs so that the large valve 14 will snap closed.

It will thus be seen that the lever handle 22 can at first only be moved to the left to permit lighting of the slotted igniter tube, that this ignites the pilot light, that the pilot light releases the lever handle so that it may be swung in opposite direction, and that such a movement at once extinguishes the igniter tube, switches the gas feed of the pilot light and also turns on the main burner which is at once ignited from the pilot. It will also be seen that at any time the pilot goes

out the main burner is shut off and cannot again be ignited without first lighting the pilot in the manner described.

Having thus described my improved thermostatic fuel control apparatus it will be seen to be a class of mechanism wherein many changes in details can be made without affecting the principles involved, and any such changes as come within the spirit of the invention are intended to be covered in my appended claims.

I claim:—

1. In a safety device for heaters the combination of a heating member, a deformable element of one material having one edge adjacent to said heating member to receive the heat developed at said member, and having another edge more distant from the heating member to receive a lesser degree of heat developed at said member whereby said deformable element is deformed, and means whereby said deformation of said deformable element allows the energizing of said heating member, and whereby its cooling and return to its normal shape cuts off the means for energizing said heating member.

2. In a safety device for heaters the combination of a heating member and a deformable element having one edge adjacent to said heating member to readily receive the heat developed at said member, and having another edge more distant from the heating member to receive a lesser degree of heat developed at said member, said deformable element also having a series of perforations between its said hot and cooler edges to allow a relative movement between said hot and cooler edges by the stretching of a relatively small amount of material between said perforations, and to also resist the passage of heat between said edges through the relatively small amount of material between said perforations.

3. In combination with a source of heat, a thermostatic device comprising a flat strip of metal having one edge intermediate the ends of the strip disposed in closer heating proximity to said heat source than the opposite edge and having one end fixed whereby the opposite end of the strip will flex in the plane of the strip.

4. In combination with a source of heat, a thermostatic device comprising a flat strip of metal having one edge intermediate the ends of the strip disposed in closer heating proximity to said heat source than the opposite edge and having one end fixed whereby the opposite end of the strip will flex in the plane of the strip, said strip being arched edgewise to form a substantially U-shaped member having a pair of legs and an intermediate connecting portion.

5. In combination with a source of heat, a thermostatic device comprising a flat strip of metal having one edge intermediate the ends of the strip disposed in closer heating proximity to said heat source than the opposite edge and having one end fixed whereby the opposite end of the strip will flex in the plane of the strip, said strip having at least one opening between the heated edge portion and the opposite edge portion.

6. In combination with a source of heat a thermostatic device comprising a flat strip of metal having one edge intermediate the ends of the strip disposed in closer heating proximity to said heat source than the opposite edge and having one end fixed whereby the opposite end of the strip will flex in the plane of the strip, said strip

being arched edgewise to form a substantially U-shaped member having a pair of legs and an intermediate connecting portion, said strip having at least one opening between the heated edge portion and the opposite edge portion.

7. The device of claim 6 characterized by having the opening in the connecting portion, and the source of heat located adjacent said connecting portion and between the legs.

8. A thermostatic device comprising a substantially flat elongated plate of metal formed substantially to U-shape in the plane of the plate and arranged for anchoring at one end to a support and with the opposite end of the plate free to move, and whereby when said anchored plate is heated at one edge adjacent the U-bend the free end will move in the plane of the plate for doing useful work, the cross sectional area of the metal in said plate being reduced along the inner or concave portion of the U-bend whereby said portion will expand more readily than the outer portion of the bend upon application of heat.

9. A thermostatic device comprising a substantially flat elongated plate of metal formed substantially to U-shape in the plane of the plate and arranged for anchoring at one end to a support and with the opposite end of the plate free to move, and whereby when said anchored plate is heated at one edge adjacent the U-bend the free end will move in the plane of the plate for doing useful work, the cross sectional area of the metal in said plate being reduced along the inner or concave portion of the U-bend by holes formed therethrough whereby said portion will expand more readily than the outer portion of the bend upon application of heat.

10. A thermostatic element comprising an elongated plate of corrosion-resisting metal formed into substantially U-shape in the plane of the plate, and the section of the metal weakened along the margin of the curve of the U so that when heat is applied to the weakened area the ends of the plate will move relatively to one another in the plane of the plate for doing useful work.

11. A thermostatic element comprising an elongated plate of corrosion-resisting metal formed into substantially U-shape in the plane of the plate, and the section of the metal weakened by an opening in the plate along the margin of the U so that when heat is applied to the weakened area the ends of the plate will move relatively to one another in the plane of the plate for doing useful work.

12. A thermostatic element comprising an elongated plate of corrosion-resisting metal formed into substantially U-shape in the plane of the plate, and the section of the metal weakened by a plurality of openings in the plate along the margin of the U so that when heat is applied to the weakened area the ends of the plate will move relatively to one another in the plane of the plate for doing useful work.

13. A thermostatic element comprising an elongated plate of corrosion-resisting metal weakened along one margin at a point intermediate the ends of the plate, so that when heat is applied to the weakened area the ends of the plate will move relatively to one another in the plane of the plate for doing useful work.

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