

June 2, 1942.

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2,284,994

FLOOR FURNACE VALVE

Filed June 5, 1941

2 Sheets-Sheet 1

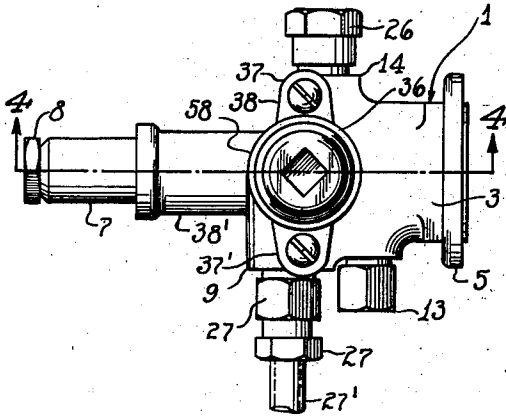


Fig-1

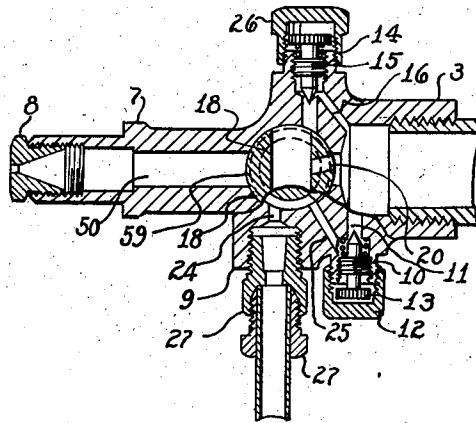


Fig-2

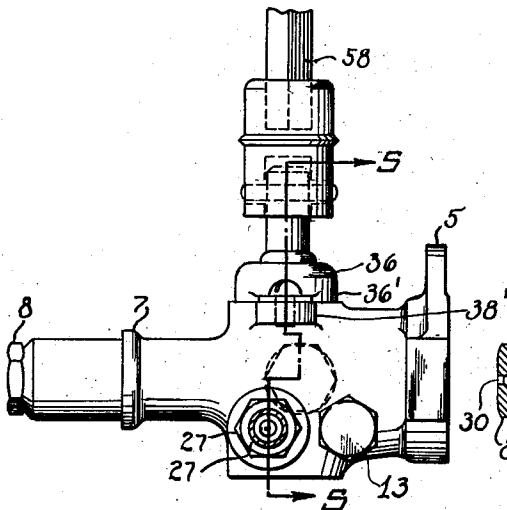


Fig-3

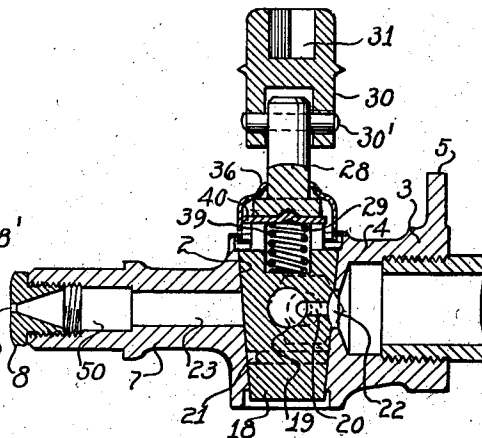


Fig-4

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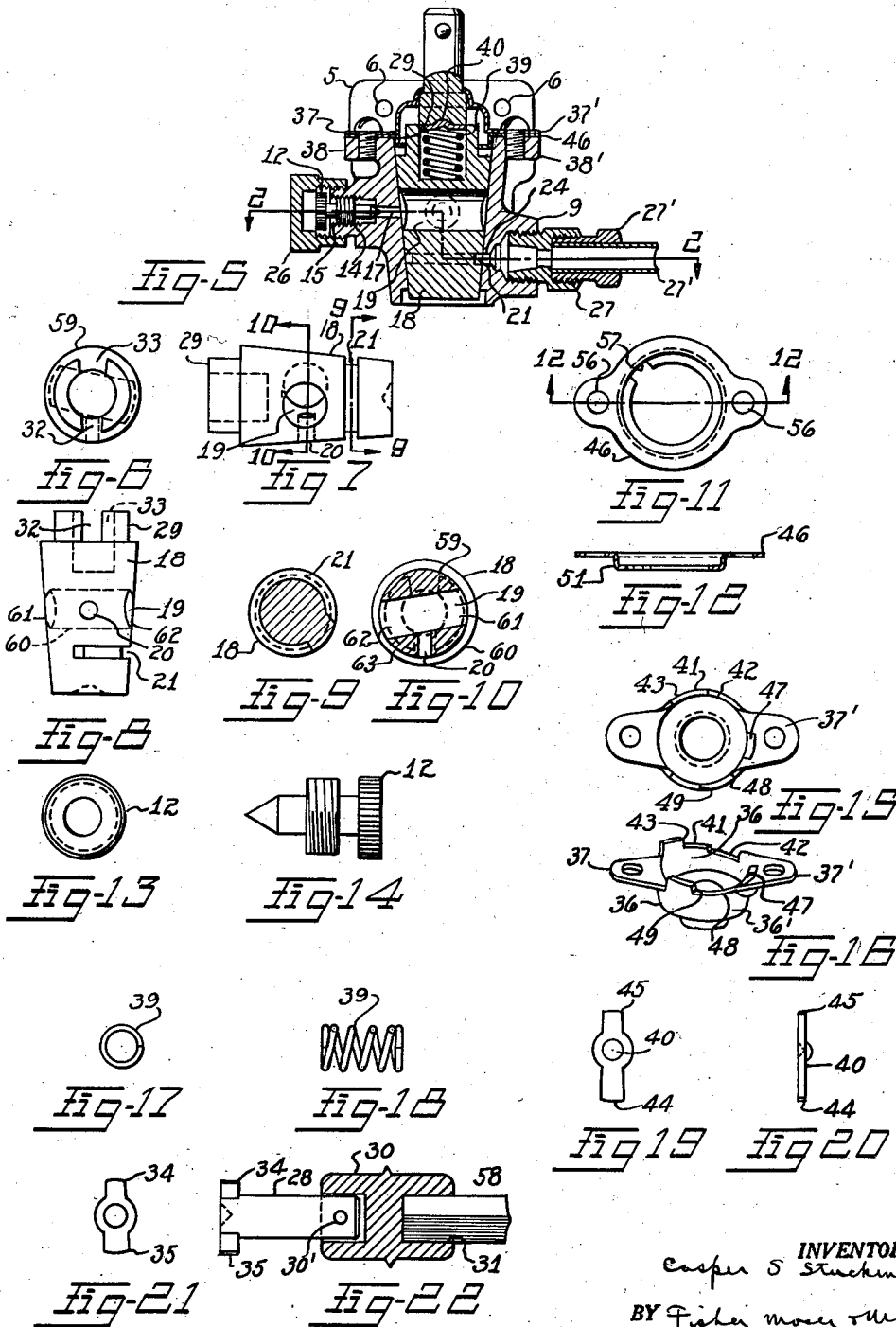
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,284,994

FLOOR FURNACE VALVE

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Application June 5, 1941, Serial No. 396,765

2 Claims. (Cl. 251—105)

This invention relates to improvements in valves, being particularly directed to valves for use with floor furnaces.

The conventional floor furnace construction comprises a cast manifold upon which is mounted two valves for supporting gas to a pilot and main burner respectively. In order to meet requirements of the American Gas Association laboratory, to the effect that means must be provided for preventing the main burner valve from being turned on before the pilot valve, it has been the practice to employ valves with special swivels and a locking plate connecting one valve with the other. The use of two valves embodying such special features as the locking plate and swivels has proven expensive and otherwise somewhat unsatisfactory.

One of the general objects of the present invention is to provide a single valve capable of meeting the aforesaid requirements thus eliminating the locking plate.

A further object of the invention is to provide a valve of the above character with means for providing a high or a low volume flow of gas to the main burner.

Other objects and advantages will be apparent as the description is considered in connection with the accompanying drawings wherein:

Figure 1 is a plan view of the improved plug valve as used with a manually controlled furnace;

Figure 2 is a section taken on line 2—2 of Figure 5;

Figure 3 is a side elevation of the valve;

Figure 4 is a section taken on line 4—4 of Figure 1;

Figure 5 is a section taken on the line 5—5 of Figure 3;

Figure 6 is a plan view of the improved plug valve;

Figure 7 is a side view of the improved plug valve;

Figure 8 is a side view of the plug valve;

Figure 9 is a sectional view taken on line 9—9 of Figure 7;

Figure 10 is a sectional view taken on line 10—10 of Figure 7;

Figure 11 is a plan view of the safety lock washer;

Figure 12 is a sectional view of the safety lock washer taken on line 12—12 of Figure 11;

Figure 13 is a plan view of the needle valve;

Figure 14 is a side view of the needle valve;

Figure 15 is a bottom view of the flanged cap member;

Figure 16 is a perspective view of the flanged cap member;

Figure 17 is an end view of the plug valve coil spring;

Figure 18 is a side view of the spring shown in Figure 17;

Figure 19 is a plan view of the locking plate;

Figure 20 is a side view of the locking plate;

Figure 21 is an end view of the valve stem;

10 and

Figure 22 is a partial sectional view of the valve stem swivel and operating rod.

Referring more particularly to the drawings the improved valve comprises a preferably cast valve housing or casing 1, having therein a vertically disposed tapered plug receiving bore 2. Projecting rearwardly at right angles to the bore 2 is an enlarged hollow gas inlet extension 3, interiorly threaded as at 4 and provided with an upwardly extending fastening flange 5. The extension 3 is adapted to be threadedly connected with the house gas supply line (not shown), and the flange 5 is provided with screw openings 6, to facilitate securing the valve to a suitable support such as the wall of a furnace, also not shown.

Projecting outwardly from the front of the casing 1, is a horizontally disposed hollow extension 7 axially aligned with the bore of rearwardly extending hollow extension 3. The outer end of the extension 7 is provided with an adjustable threaded perforated cap 8, through which gas will flow to the usual mixing tube of a main burner, not shown. These oppositely projecting hollow extensions 3 and 7 communicate with the plug receiving bore 2 at their outer and inner ends respectively, through aligned oppositely disposed openings 22 and 23 in the casing.

A pair of parallel extensions or nipples 9 and 10 extend outwardly from the right side of the casing, when looking toward the front end of extension 7. The nipple 9 is adapted for connection with a conventional pilot light for the main burner, also not shown, a length of copper tubing or the like 27' connected to a coupling member 27, being employed for this purpose. Gas is delivered to the nipple 9 through a transverse passage 24 adapted to communicate with a plug valve 13 in a manner presently understood. The nipple 10, which communicates with the interior of hollow gas inlet extension 3, by means of a transverse passage 11 in axial alignment with the well of nipple 10, serves as a means for adjusting the rate of gas flow from the nipple 10,

to the plug valve 18, through an inwardly and forwardly inclined passage 25, and finally through nipple 9 to the pilot light or burner. Thus the nipple 10 is provided with a needle valve 12 which is in turn enclosed and protected by means of a cap 13. This needle valve regulates or adjusts the amount of gas flowing from inlet extension 3 into nipple 10 through transverse passage 11 and thence out through inclined passage 25, in an obvious manner.

A second adjustment nipple 14, projecting from the left hand side of the casing, or in a direction opposed to the pilot adjustment extension or nipple 9, provides for a predetermined low or simmer flame at the burner when the valve is moved to reduced flow or simmer position. This nipple 14 is internally threaded to receive a needle valve 15, similar to the valve 12. Gas flowing into the nipple 14 through an inclined passage 16, leading from hollow extension 3, to the well of nipple 14, continues through a horizontally disposed axial passage 17 leading inwardly from the nipple to plug receiving bore 2, and finally to the apertured outlet nipple or extension 7, in a manner presently described. The volume of flow can be reduced to any desired predetermined minimum by screwing the needle valve inwardly in an obvious manner. A cap 26 encloses and protects the needle valve 15 against tampering.

The tapered plug or valve 18 is adapted to be snugly but rotatably received in the tapered bore 2 of the casing 1. The valve plug is formed with a large transverse opening 19, approximately midway of its length, and with a relatively small transverse opening 20 leading to the larger opening 19. The opening 20 extends at right angles to the opening or passage 19 and in a plane which bisects the axis of the latter approximately midway its length. The plug is also formed with a peripheral groove or passage 21, extending around the lower end of the plug approximately 270° and is spaced downwardly a substantial distance from the plug openings or passages 19 and 20. When the plug is seated in the bore 2, the groove 21 therein will lie in a common plane with the inner ends of inclined passage 24 and axial passage 25, leading respectively from bore 2 to nipple 9 and from nipple 10 to bore 2, so that these passages 24 and 25 will be in the path of movement of the groove. Likewise the aligned main inlet and main outlet openings 22 and 23 leading from the hollow extension 3 to the bearing surface of the plug receiving bore 2 and from the bore to and through the passage 50 of extension 7, respectively lie in the path of movement of and are adapted to be brought into and out of register with the plug passages 19 and 20 when the plug valve is appropriately rotated.

In operation the valve plug is manually rotated by means of a valve stem 28 having its lower or inner end extending into and interengaging with a hollow extension 29 formed on the outer end of the plug, the stem being provided with a socket member 30 swiveled thereto by means of pin 30'. This member is formed with a squared opening 31, adapted to receive the correspondingly squared lower end of a conventional and relatively long operating rod or handle 58, which is manually manipulated from the floor above. The movable socket member 30 facilitates the operation of connecting the long rod 58 to the stem and also affords sufficient flexibility to prevent the valve from binding during movement from one station to another. Hollow ex-

tension 29 is formed with two oppositely arranged slots 32 and 33 of different width to slidably receive finger portions 34 and 35 integrally formed on the inner or lower end of stem 28, when the latter is partially inserted within the hollow extension against the tension of a coil spring 39, seated in the hollow extension. The finger portions are proportioned to fit the slots 32 and 33 and are of different width to insure proper assembly. A locking plate or member 40 seated on the coil spring between the latter and the end of the stem, is formed with fingers 44 and 45 of different length and width adapted to be forced into interlocking engagement with the slots 32 and 33 by the stem.

A flanged apertured cap member 36 sleeved over the valve stem is formed with a depending flange 36' having apertured ears 37 and 37' which seat upon and are secured to laterally extending aperture lugs 38 and 38' formed on the upper face of outer end of the casing 1. A safety lock washer 46 is interposed between the cap member 36 and the end face of the casing for a purpose presently described. The forwardly facing portion of the cap flange 36' is formed with a cut away portion or recess 41 approximately midway between the two apertured ears 37 and 37' and adjoining this recess in stepped relation thereto is a second and deeper cut out portion or recess 42 which extends to the apertured ear 37'. One end of the recess 41 serves as a stop shoulder 43 for limiting movement of the valve in a clockwise direction when the elongated arm 44 of the locking plate 40, is moved thereagainst. The cap 36 is also formed with a depression 47 at the point of juncture between the depending cap flange 36' and the apertured ear 37' and the inwardly or rearwardly facing portion of the flange is formed with a cut away portion or recess 48. The recess 42 and the depression 47 serve to respectively lock and resiliently latch the valve against movement in either direction when the locking and latching plate 40 reaches these respective stations, while one end 49 of the cut away portion 48 serves as a stop wall to prevent further anti-clockwise rotation of the valve when the latter is in position to permit a low flow of gas to the burner.

When the valve is in off or inactive position the arm 44 engages the stop shoulder 43 of recess 41 and prevents rotation in a clockwise direction. If the valve is now rotated in an anti-clockwise direction until the arm 44 of lock plate 40, registers with the recess 42, the coil spring 39 forces the arm 44 into this recess with an audible clicking or snap action thus locking the valve in its first active position and in which a reduced supply of gas is delivered to the pilot light connection or nipple 9. The pilot gas enters hollow casing extension 3 from the house gas line, not shown, and thence into nipple 10 through small transverse passage 11, axially aligned therewith. From nipple 10 the pilot gas flows through the inwardly and forwardly inclined passage 25, leading from the nipple 10 and through the bearing surface of the vertical plug receiving bore 2, formed in the casing 1, where it is picked up by the plug slot or groove 21 which also communicates with the transverse passage 24 leading from the bore 2, to the nipple 9. Manual adjustment of the pilot flow, to compensate for different pressures and kinds of gases encountered in various localities, can be readily made by removing the cap 13 from nipple 10 and screwing the needle valve 12 into or away from the outlet end

of passage 11, according to whether it is desired to reduce or increase the flow of gas to the pilot light.

In order to rotate the valve to its second active or full on position, in which a full flow of gas is delivered to the main burner, the stem must be moved inwardly in an axial direction until the arm 44 clears the right hand wall of recess 42. Whereupon rotation of the valve in an anti-clockwise direction is continued until the operator is apprised, when he hears a slight clicking sound caused by the arm 44 being forced into the depression 47, that the desired full flow station has been reached. A full stream of gas from inlet extension 3 will now flow through transverse plug passage 19, which is aligned with and places the plug inlet and outlet openings 22 and 23 in communication with each other, and thence through the apertured extension 7 to the burner. In this position the long arm 44 of plate 40 is resiliently latched in the depression 47 and the previously described flow of gas to the pilot continues.

Still further rotation of the valve plug in an anti-clockwise direction may be effected by merely overcoming the resistance offered by the resiliently pressed arm 44 against movement out of its latching position against the tension of spring 39. When the arm 44 engages the previously described shoulder 49 at one end of the cut away portion or recess 48, anti-clockwise rotation of the plug will be definitely stopped. Gas will now flow from main inlet 3 through the small forwardly and outwardly inclined passage 16 leading from the inlet 3 to the predetermined low flow adjustment nipple 14 and thence inwardly through an axial or transverse passage 17, leading from the nipple 14 to the interior or large passage 19 of plug 18 and finally out through the small plug opening 20. The latter, at this time registers with the outlet opening 23 in the casing leading to the gas passage 50 in extension 7, which in turn is connected to the main burner. We now have a predetermined reduced flow of gas to or predetermined low flame at the main burner with gas also flowing to the pilot. While the maximum flow of gas to and through the fitting or extension 7 in this position is much less than when the valve is in full or high position, any desired or finer minimum low flow adjustment may be made by merely removing the cap 26 and screwing the adjustment valve 15, in an appropriate direction.

It will be understood that when the valve plug 2 is in off or closed position, the small plug opening or passage 20, of the plug 18, will register with the gas inlet extension 3 and the low flow adjustment nipple or well 14 respectively. It will also be noted that, in this position, the large passage 19 will be out of register with the opening 23 leading to passage 50 in extension 7, the opening 23 being thus closed. At the same time, it will also be noted that forwardly and inwardly inclined passage 25 leading from pilot flow adjustment nipple 10, to the plug receiving bore 2, is closed or blocked at the bore by that solid space or area 59 of the plug extending between the opposite ends of the groove 21, and consequently no gas can flow to either the pilot or main burner.

In the first active or pilot position the transverse passage 17 leading from the low flow adjustment nipple 14 to the plug bore is closed by the area or space 60 between the small passage

20 of the plug and one end 61 of the larger plug passage 19, the small passage 20 being located somewhat closer to the end 61 of passage 19 than to the other end 62 thereof. Flow of gas from nipple 14 is thus closed and therefore no gas can reach the extension 7 or main burner from this source. The small opening 20 will also have been moved slightly in a clock-wise direction out of register with the opening 22 connecting inlet 3 with the casing bore 2 and the larger area or space 63 between the small bore 20 and the end 62 of passage 19, will close the passage 23 leading to extension 7 and thence to the main burner. However the groove 21 will now bridge the space between the passages 24 and 25 and permit gas from inlet 3 and nipple 10 to reach nipple 9 and the pilot.

In the second or full flow position the passage 17 leading from nipple 14 to the bore 2 is closed by the space 63 and the full flow casing and plug passages will be in alignment with each other thus permitting a full flow of gas direct from inlet 3 to the burner. As the plug groove 21 continues to bridge the pilot flow passages 24 and 25 gas continues to flow to the pilot.

Further movement of the plug about ninety degrees in an anti-clockwise direction moves the plug to its third active or low flow position with the end 62 of passage 19 out of register with the full flow passage 22 and into register with the low flow passage 17, without disturbing the communication between the plug groove 21 and the pilot flow passages 24 and 25. The small low flow plug opening or passage 20 will now register with outlet passage 50 in extension 7. A reversal of the above described operations will take place during return movements of the valve through full on and pilot flow back to closed position.

The lock washer 46 previously referred to herein, is provided with apertured ears 56, corresponding to the apertured ears 37 and 37' on the cap 36, to facilitate assembly on the casing lugs 38 and 38'. The washer 46 is also formed with a depending horizontally disposed flange 51, which is provided with a cut out portion or notch 57 corresponding in size to and in vertical alignment with the locking notch 42 of the cap 36. Considerable difficulty was experienced with the present valve, prior to the adoption of the lock washer, due to the fact that when shifting the valve stem axially in order to turn the valve plug from one station to another, the operator would frequently miss the desired station. This was due to the fact that because of the necessity of operating the valve from a distance, through the medium of the long heavy and unwieldy rod 58, previously mentioned herein, it was impossible for the operator to hear the clicking of the locking plate 40, or to otherwise accurately determine the exact location of the arm 44 of this plate. By providing the flanged locking washer, it becomes necessary for the operator to feel for the desired position thus obviating the likelihood of inadvertently passing the desired station by pressing down too hard on the rod 58, connected to the valve stem. As an illustration, when the plug valve is in the first active or pilot flow position the long arm 44 of the plate 40 is seated in the locking notch 42, directly over the notch 57 in the flange 51 of the lock washer. Consequently if much pressure is exerted on the operating rod or handle 53 the arm 44 will be forced into locking notch 57 and the valve will remain locked, and the operator will be definitely apprised as to position and

therefore can, by the exercise of reasonable care, rotate the valve plug with certainty to any other desired active or inactive position.

Having thus described my invention:

What I claim is:

1. A valve for floor furnaces comprising a casing with a plug receiving bore, a plug having rotatable bearing in said bore, said casing having inlet and outlet extensions leading to and from said bore respectively, said inlet extension being adapted for connection with the house main gas supply line and said outlet extension being adapted for connection to the mixing tube of the furnace burner for conducting gas thereto, said casing having a second outlet extension provided with a restricted passage leading to said bore for conducting gas from the bore to the pilot light for the furnace burner, a hollow extension on each side of said casing forming pockets, each of said pockets having a restricted passage leading thereto from said hollow inlet extension and also having a restricted passage leading to said plug receiving bore, said plug having an arcuate peripheral slot adjacent one end, a large cross passage extending transversely through the plug intermediate the ends thereof and a restricted opening leading from the periphery of the plug to and in a direction substantially at right angles with said large cross passage, said restricted passage leading from one of said pockets and from said second outlet extension to said bore respectively being bridged by said arcuate slot and said restricted passage from the other of said pockets and the said inlet and outlet extensions being in the path of movement of said large passage and said communicating restricted passage in the plug such that when the plug is rotated from a closed position to its first active position a reduced flow of gas may flow from the inlet extension to and through one of said pockets to said bore and thence through said arcuate slot into said second outlet extension, the flow of gas to the first outlet extension being blocked by the plug, and such that when the plug is rotated to its second active position a full volume of gas may flow from the inlet extension through the large cross passage in the plug to the first outlet extension while reduced flow to said second outlet extension continues, and such that when said valve plug is rotated to its third active position a reduced volume of gas may flow from the inlet extension to and through the other of said pockets and thence through the large passage way in the plug to and through the restricted transverse passage in the plug to the first outlet extension while reduced flow to said second outlet extension continues.

2. A valve for floor furnaces comprising a casing with a vertically arranged plug receiving bore, a plug rotatable in said bore and having an upwardly extending stem, a socket member attached to said stem for relative rocking movement and adapted for the attachment of an elongated rod for operating the valve, said casing having aligned gas inlet and outlet extensions communicating with the said bore and adapted to be connected respectively to a main gas supply line and to the mixing tube of the furnace burner for conducting gas thereto, said casing having a second outlet extension at one side of the casing formed with a restricted outlet passage communicating with the plug receiving bore for conducting gas to the pilot light of the furnace burner, said inlet extension having restricted conducting means for conducting a restricted flow of gas to said bore at one side thereof and at a point adjacent said restricted outlet passage, said casing having a second restricted conducting means for conducting a restricted flow of gas to said bore at the other side thereof and from a point adjacent the main outlet of the inlet extension, said plug having an arcuate slot adjacent one end, a large cross passage in the plug and a restricted opening in the plug communicating with said cross passage, said first mentioned restricted conducting means and said restricted outlet passage being bridged by said arcuate slot and said inlet and outlet extensions being in the path of movement of said large passage and said communicating restricted passage in the plug such that when said plug is rotated from a closed position to its first active position a reduced flow of gas may flow from the inlet extension through said first mentioned restricted conducting means to said bore and thence through said arcuate slot into said second outlet extension, the flow of gas to the first outlet extension being blocked by the plug, and such that when the plug is rotated to its second active position a full volume of gas may flow from the inlet extension through the large cross passage in the plug to the first outlet extension while reduced flow to the second outlet extension continues, and such that when the said valve plug is rotated to its third active position a reduced volume of gas may flow from the inlet extension to and through said second restricted conducting means to said bore at the side thereof substantially opposite said restricted outlet passage and thence through the large passageway in the plug to and through the restricted transverse passage in the plug to the first outlet extension while reduced flow to said second outlet extension continues.

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