Dec. 4, 1934. E. J. BRADY ET AL 1,983,213

GAS BURNER CONTROL

Filed July 24, 1933

Fig. 1.

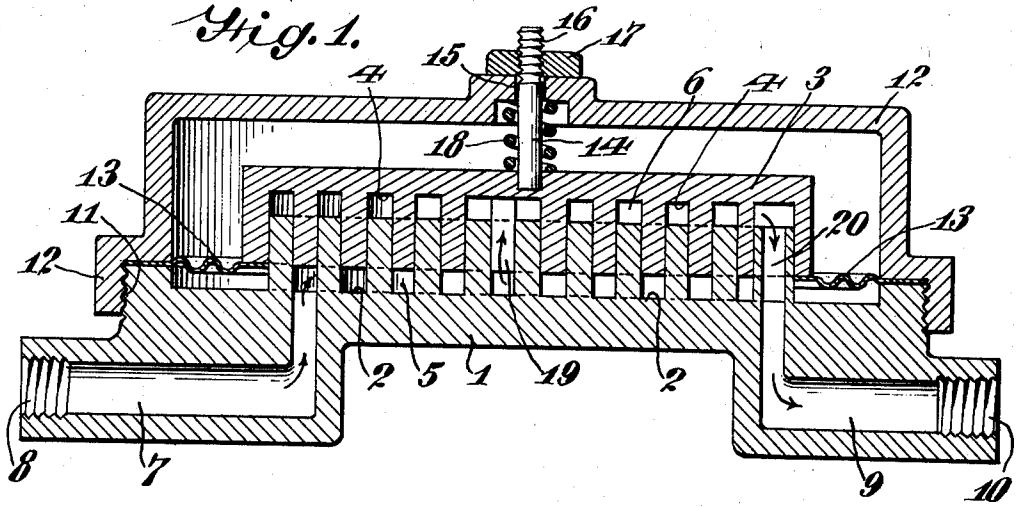


Fig. 2.

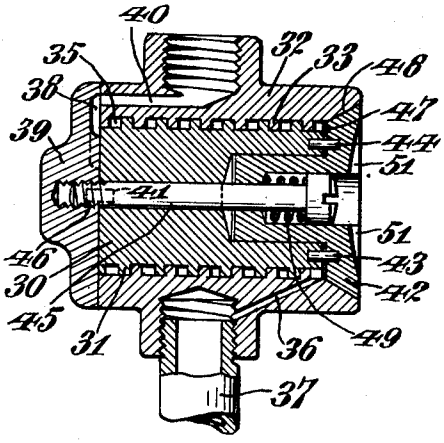


Fig. 3.

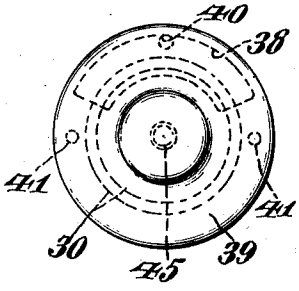


Fig. 4.

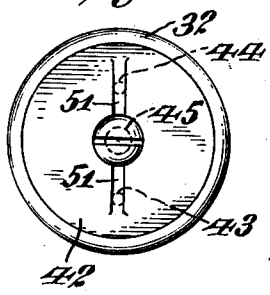


Fig. 5.

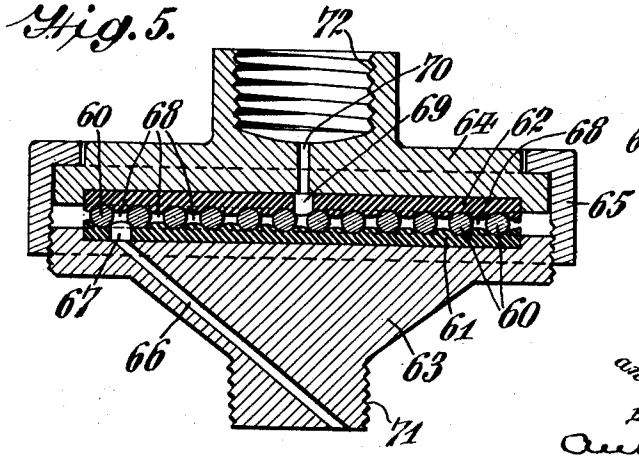
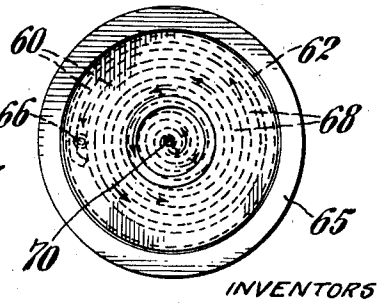


Fig. 6.



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UNITED STATES PATENT OFFICE

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GAS BURNER CONTROL

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Application July 24, 1933, Serial No. 681,936

5 Claims. (Cl. 158—115)

The present invention relates to gas pilot lights.

Gas burning appliances such as ranges, water heaters and the like, which are employed for intermittent heating operations, are usually provided with pilot lights intended to burn continuously to provide ignition when the larger flow of gas is turned on for the heating operation.

For purposes of economy, such pilots are arranged to burn with a small flame, consuming only a small quantity of gas. For instance, with manufactured gas, a typical pilot consumption on a gas range is about 0.2 to 0.3 cubic foot per hour.

In the usual pilot arrangement, the flame is supplied with gas through a needle valve orifice adjusted to pass the required quantity of gas to maintain the flame. Practically all of the pressure drop between the gas supply and atmosphere at the pilot tip takes place at the needle valve, and to secure the small flow required the annulus around the needle is of very small width. In a typical case of a gas range pilot supplied with gas at a pressure of 3½ inches of water at the burner bar and a consumption of 0.2 to 0.3 cubic foot per hour with the needle valve properly centered the orifice width is of the order of .00028 inch.

One of the recurring sources of trouble in gas distribution is the outage of pilot lights due to stoppage of these needle valve orifices. These outages cause expense to the distributing company in correcting the trouble and are a source of danger to the consumer.

One of the principal causes of pilot valve stoppage is the presence of small particles of gummy or resinous material in the gas. This is particularly true in situations in which coal gas is distributed. In other situations, dust is the principal cause of stoppage, while in others the stoppage may be caused by both gum and dust.

In the copending applications, Brady and Fulweiler 667,647, filed April 24, 1933, and Perry and Brady 667,648, filed April 24, 1933, are described improved pilot controls in which the flow of gas to the pilot is controlled by flow through a long tortuous passage the width and depth of which is many times greater than the width of the usual needle valve orifice when adjusted for the same flow under the same pressure conditions, and in which the likelihood of stoppage is very greatly reduced.

The principal object of the present invention is to provide an improved pilot control having such a long tortuous passage for controlling the gas flow and having means for regulating the flow by changing the cross sectional area of the passage.

Inasmuch as the flow through such a long passage varies approximately as the fourth power of the diameter of a circle having an area equivalent to the cross sectional area of the passage, small changes in the cross sectional area of the passage produce large changes in the flow, and the required movement for adjustment may be very small.

Fig. 1 shows a cross section of one form of the invention chosen for illustration.

Fig. 2 shows a cross section of a second form of the invention.

Fig. 3 shows an end elevation of a portion of the apparatus of Fig. 2.

Fig. 4 shows an end elevation of an other portion of the apparatus of Fig. 2.

Fig. 5 shows in cross section a third form of the apparatus of the invention, and

Fig. 6 is a view drawn to a reduced scale and showing the spiral gas way.

Referring to Fig. 1, 1 indicates a stationary member provided with a straight walled spiral groove, the base of which is indicated at 2. 3 is a movable member provided with a straight walled spiral groove the base of which is indicated at 4. The two grooves are so formed that the projections between turns of one groove accurately fit into the turns of the other groove and are slidable therein, forming two spiral passages 5 and 6, the depth of which may be simultaneously varied by moving the movable member 4 so that the projections between the turns of groove 2 extend to a greater or lesser extent into the groove 4 and the projections between the turns of groove 4 likewise extend to a greater or lesser extent into groove 2.

The member 1 is provided with the gas inlet passage 7, threaded at 8 for the pipe leading to the gas supply, and with the gas outlet passage 9 threaded at 10 for the pipe leading to the pilot burner. The member 1 is threaded at 11 to engage the cover 12, which is screwed down on the outer portion of the annular spring disc 13, the inner portion of which is attached to the movable member 3, providing a gas tight closure while permitting movement of member 3 with respect to member 1. The stem 14 attached to the member 3 passes through the opening 15 in the cover and is threaded at 16 to engage the nut 17. The spring 18 is arranged to hold the nut 17 against the cover 12. The member 3 is cut out at 19 to provide a passage between the two spiral passages formed by the grooves, and the

member 1 is drilled at 20 to provide a connection between the outlet passage 9 and the spiral passage 6. In operation, gas passes from the source of supply as for instance the burner bar of a gas range, through the inlet passage 8 to the spiral passage 5 and thence inwardly through that passage to the passage 19, from whence it flows into the spiral passage 6 and outwardly through that passage to the connecting passage 20 leading to the gas outlet 9, and thence to the pilot burner. If the flow through the spiral passages is decreased due, for instance, to a drop in pressure of the gas supply, and it is desired to increase the flow, by turning the nut 17 the member 3 is moved upwardly with respect to member 1 and the cross sectional area of the spiral grooves 5 and 6 increased, increasing the flow of gas therethrough. As the flow varies approximately as the square of the cross sectional area of an equivalent circle, a slight relative movement of the two members produces a relatively large variation in flow.

If it is desired to decrease the flow, the nut 17 is moved in the opposite direction and due to action of the spring 18, the member 3 is moved downwardly decreasing the cross sectional area of the spiral grooves and decreasing the flow. The spring member 13 which may be of phosphor bronze seals off the gas from the space between the member 3 and the cover 12, so that the opening 15 need not be gas tight. The spring 18 is provided with sufficient spring action to overcome the resistance of the spring disc 13. The grooves in members 1 and 3 have been described as spirals, other forms of sinuous or tortuous grooves may be employed. The arrangement of Fig. 1 lends itself to employment with a variety of gas appliances as a wide variation in gas flow may be secured by adjusting the relative positions of members 1 and 3. With slight modification, it may be employed for controlling the flow to the burner of a gas refrigerator which burns continuously with a relatively small flame, but at varying rates as demanded by the cooling requirements. For instance, instead of providing the hand adjustment means consisting of the nut 17 and the thread 16, the stem 14 may be actuated by thermostatic means responsive to the cooling requirements and the gas flow to the burner varied automatically thereby as required.

Referring to Figs. 2, 3 and 4, 30 indicates a cylindrical or slightly tapering member provided with the screw thread indicated as 31, and surrounded by the member 32 provided with the female screw thread 33. The two threads are of the same pitch, which is considerably greater than the combined width of the two threads 31 and 33, so that when the threads are in contact at the right of thread 31 as shown, a helical passage 35 is provided, which at one end of the member 1 is in communication with the gas inlet passage 36 leading from the pipe 37 and from the gas supply. The other end of the passage 35 leads through a port 38 formed in the base of the cap 39, and thence through outlet passage 40 in the member 32 to the pipe (not shown) leading to the pilot burner. The cap 39 and the member 32 may be provided with the dowel pins 41 to secure proper registry of the port 38. Within a recess in the member 30 is arranged the member 42 secured to the member 30 by dowel pins 43 and 44, which permit a slight axial movement between the members 30 and 42, but prevent relative rotational movement.

The pin 45 extends through the members 30 and 42 and is threaded at 46, engaging a threaded bore in the cap 39. A thin soft annular gasket 47 is arranged between the flat surface of the member 42 and the end of the member 30. At its periphery the member 42 seats in a tapered seat formed in the member 32 and indicated at 48. The spring 49 arranged within a recess in member 42 engages the base of the recess and the head of the stem 45, which is provided with a slot for use in screwing the stem into the cap 39. The member 42 is provided with the slot 51 for turning the member 42 and the member 30 with respect to the member 32.

The stem 45 holds the cap tightly against the ends of the members 30 and 32 and also through the action of the spring 49 holds the member 42 tightly in the tapered seat 48. The gasket 47 permits a slight axial movement between the members 30 and 42. If the various members were made with extreme accuracy, the members 42 and 30 might be combined in one piece, but otherwise it would be difficult to secure accurate seating of the end of member 30 against the cap 39, while the cap was seated tightly against the end of the member 32 and at the same time secure a tight seating of the tapered faces at 48. The provision of the separate members 30 and 42 with the spring and the gasket provides a little leeway and permits the gas tight assembly of the parts without the necessity of extreme accuracy in manufacture. In the illustration, the port 38 in the cap 39 is arranged to extend in an arc of about 120°.

In operation gas flows from the inlet pipe 37 through the inlet passage 36 and thence through the spiral passage 35 to the port 38, and thence through the outlet passage 40 to the pilot burner (not shown). In Fig. 2 the spiral passage 35 is shown fully open, with the threads 31 and 33 in contact on the right side of thread 31. When a smaller flow of gas is desired, the member 30 is turned a part of a turn by means of the slot 51 in the member 42, the turning movement moves the screw thread 31 to the left within the groove of the thread 33, narrowing the passage 35 and decreasing the flow through to the pilot burner. The thread 33 cooperating with the abutting surface of the thread 31 produces this result. The movement of the thread 31 to the left opens up another spiral passage similar to 35, but on the right of thread 31. Another way to describe this is to say that the thread 46 plays no part in the relative turning movement of parts 30 and 32, and that a part turn of one threaded member changes the width of the crack or space 35. The spiral space between the turns of the thread on either member is wider than the width of the thread on the other member, and by turning movement, the thread of one element is moved realtive to the thread of the other element across the spiral space for a limited distance in either direction. The turning movement is limited by the width of the spiral space 35. The spiral space on one member into which the spiral thread on the other member projects is wider than that thread so that without relative endwise movement of the members, one member can be turned relative to the other for a limited distance in one direction or the other until the thread binds against one or the other of the walls of the spiral spaces which are the sides of the thread on the other member, and between those limits a spiral passage may be provided on either side of the thread of varying widths depending upon the relative angular position of the two

members. The slot 38 is so arranged that one of these passages is always in communication with it and this passage is employed as the gas control passage. The spiral passage on the other side of the thread is always closed by the flat surface of the cap 39. The arrangement of the port 38 in cap 39 is such, however, that the end of this second spiral passage is blocked off by the flat surface of the cap in all positions between the full open position of passage 35, illustrated in Fig. 2, and its fully closed position when the left side of the thread 31 is in contact with the thread 33 and the flow of gas is through the passage 35 which discharges to the port 38 in all degrees of opening of the passage 35. In the apparatus illustrated, a rotation of the member 30 through 120° effects an adjustment of from 100% to 0% in the cross section of the passage 35.

Referring to Fig. 5, 60 indicates a spirally coiled rod between two flat gaskets 61 and 62 which may be made of resilient material such as a rubber which is not materially affected by the gas and does not take a permanent set. The gaskets and rod coil are held between the two elements 63 and 64 which are held tightly together by suitable means such as the union element 65 which engages the threaded periphery of element 63. 66 indicates a gas inlet passage which communicates through the port 67 with the outer end of the spiral passage 68 which is formed by the wire coil and the gaskets. The inner end of this passage communicates with the port 69 leading to the outlet passage 70. The element 63 may be provided with a threaded lug 71, which may be screwed into the pipe (not shown) leading from the gas supply. The element 64 may be provided with the female thread 72 into which may be screwed the pipe (not shown) leading to the pilot burner (not shown). In operation gas passes from the gas supply, through passage 66, port 67 to the spiral passage 68, through the spiral passage and thence through the port 69 and passage 70 to the pilot burner. The flow may be decreased by decreasing the cross section of the passage 68 by tightening the union member 65 and compressing the gaskets 61 and 62 into the spaces between turns of the wire coil 60 which form the passage. Release of the pressure by loosening the union member 65 permits the gaskets because of their resiliency to withdraw from the space between the rod turns and increases the cross sectional area of the passage 68 increasing the gas flow. Pressure on the gaskets crowds parts of them into the spaces 68 between the turns of the part 60 as shown in Fig. 5, and upon release of that pressure the gaskets resume their normally flat surfaces. Instead of providing the gaskets 61 and 62 of resilient material if desired they may be provided of deformable but non-resilient material such as lead. In such case, the control may be adjusted for decrease of flow by compressing the gasket into the passage 68 and if an increase in flow is later desired, the deformed gaskets may be replaced with new ones.

Other expedients may be employed for adjusting the gas flow through a long capillary passage by varying the cross section of the passage than those illustrated. The apparatus of the invention may be employed in conjunction with either the torch or flash back methods of burner ignition and upon a wide variety of gas appliances providing a readily adjustable pilot light which is not liable to outage through stoppage of the gas flow control apparatus.

It will be obvious to those skilled in the art to which the invention relates that modifications may be made in details of construction and arrangement and matters of mere form without departing from the spirit of the invention which is not limited to such matters, or otherwise than the prior art and the appended claims may require.

We claim:

1. A flow restricter for a gas burner comprising, the combination of elements relatively adjustable in respect to each other and having between them a circuitous gas way defined by walls movable in respect to each other to increase and decrease the cross-sectional area of the circuitous gas way when said elements are adjusted, a gas inlet at one end of the circuitous gas way, and a gas off take at the other end of the circuitous gas way.

2. A flow restricter for a gas burner comprising, the combination of elements relatively adjustable in respect to each other and having between them a spiral gas way defined by interfitting and overlapping spiral walls, relatively movable in the direction of their height to increase and decrease the cross sectional area of the spiral gas way when said elements are adjusted, a gas inlet at one end of the gas way, and a gas outlet at the other end of the gas way.

3. A flow restricter for a gas burner comprising, the combination of elements relatively adjustable in respect to each other and having between them a spiral gas way defined by spiral walls movable facially towards and away from each other to increase and diminish the cross sectional area of the spiral gas way when said elements are adjusted, a gas inlet at one end of the gas way, and a gas outlet at the other end of the gas way.

4. A flow restricter for a gas burner comprising, the combination of elements relatively adjustable in respect to each other and having between them a spiral gas way defined by a spiral wall and by resilient gaskets into which the wall is sunk to increase and diminish the cross sectional area of the gas way when said elements are adjusted, a gas inlet at one end of the gas way, and a gas outlet at the other end of the gas way.

5. A flow restricter for a gas burner comprising in combination nested elements mounted for relative rotation and each provided with a thread, and the spiral space between the thread on one element exceeding in width the width of the thread on the other element, thereby providing for two spiral passages one on each side of the thread and of which the cross sections are variable by relative turning movement of the elements, and means for causing gas to flow through and out of one of said passages only.

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