Dec. 19, 1939. E. G. STEFFEN 2,183,825

VALVE STRUCTURE

Filed March 3, 1939

Fig-1

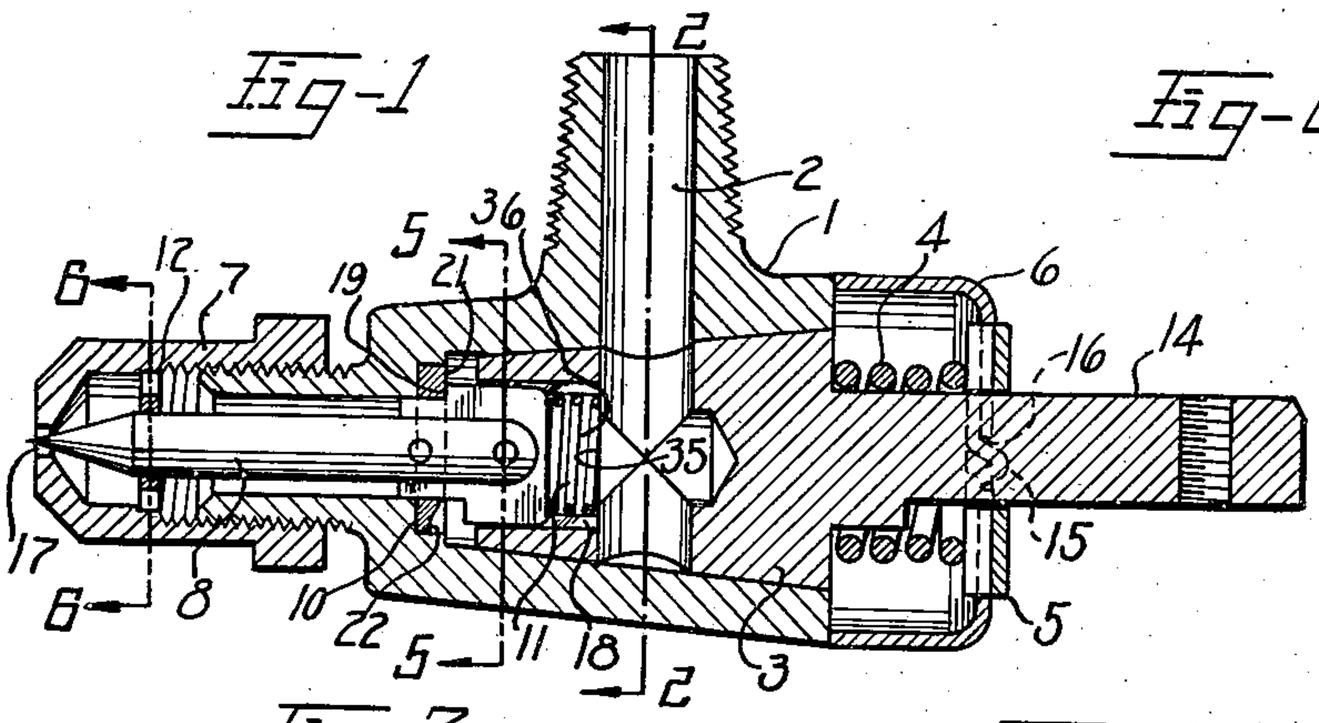


Fig-2

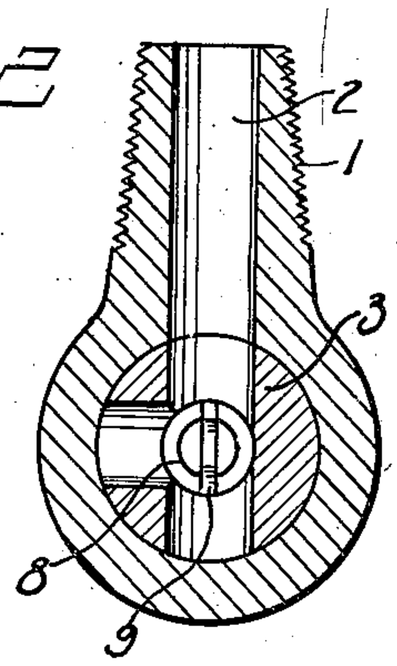


Fig-3

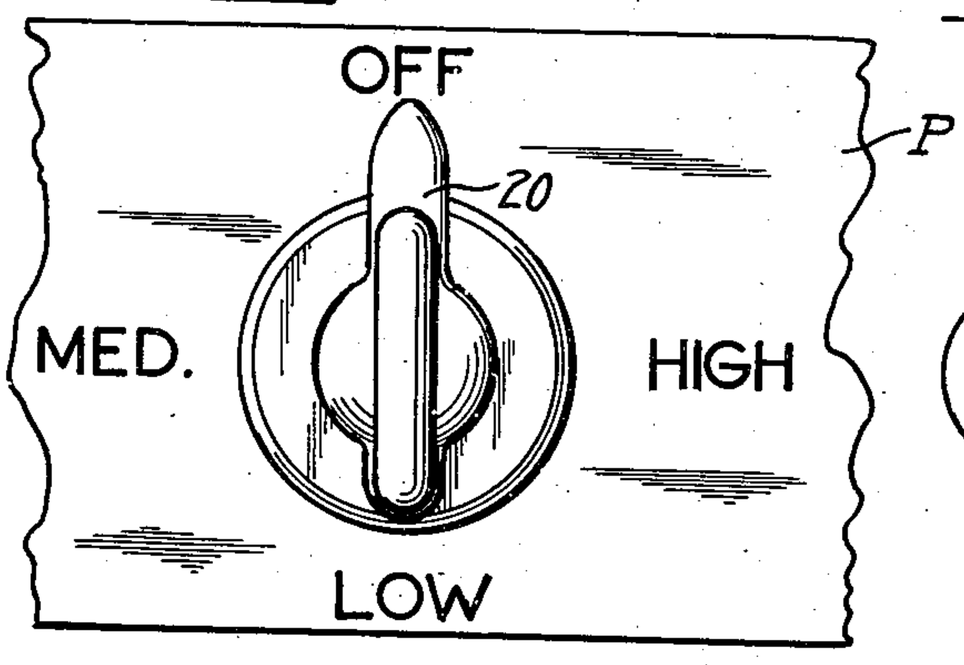


Fig-4

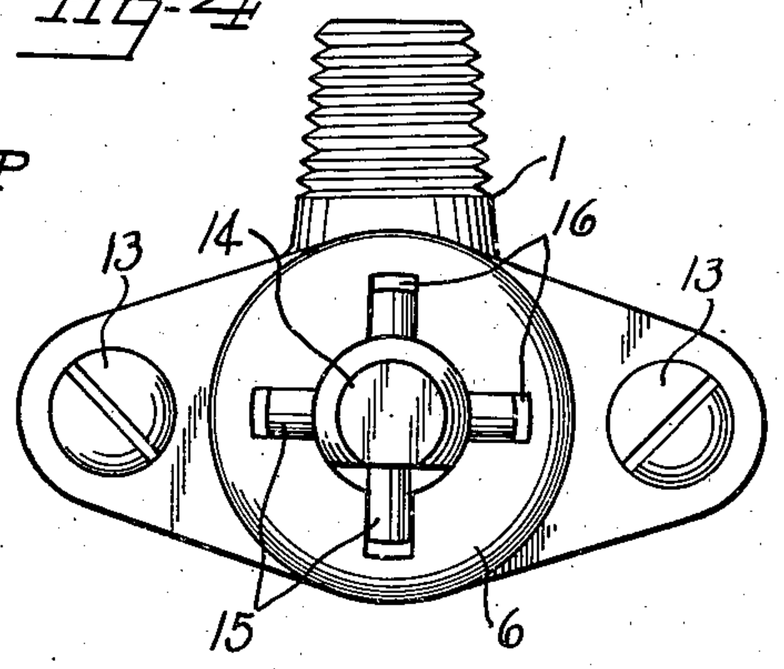


Fig-7

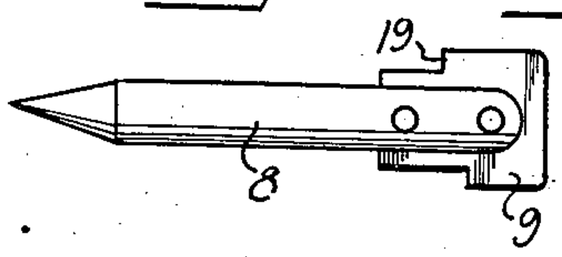


Fig-8

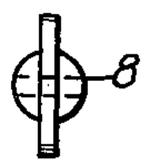


Fig-9 Fig-10 Fig-11 Fig-12

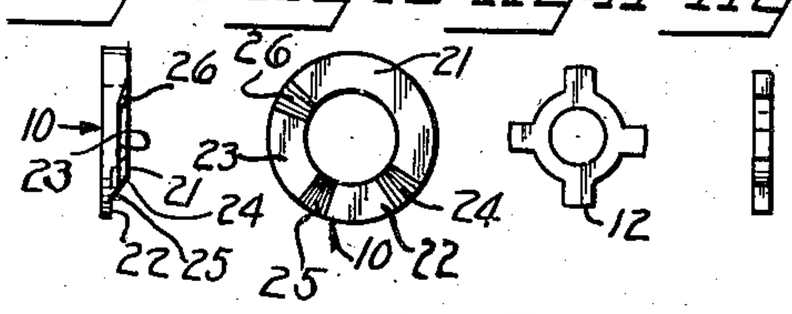


Fig-13

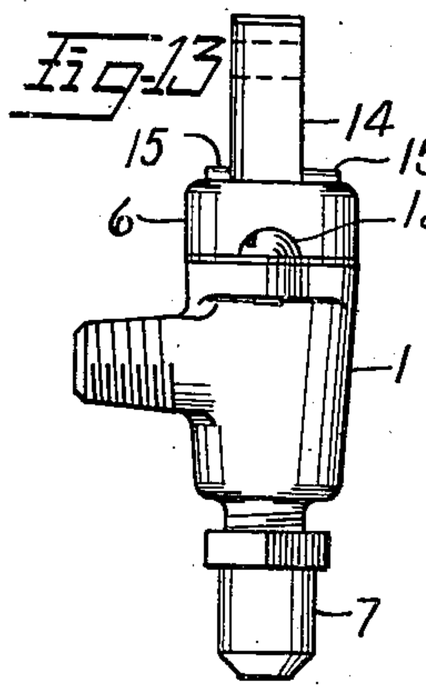


Fig-14

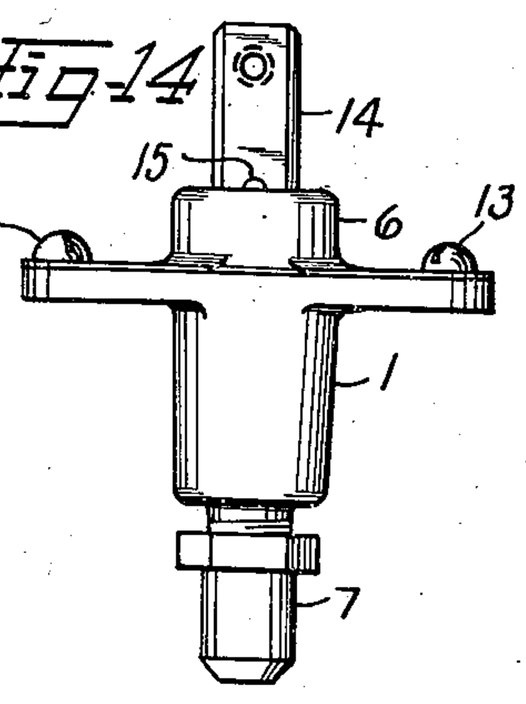


Fig-5

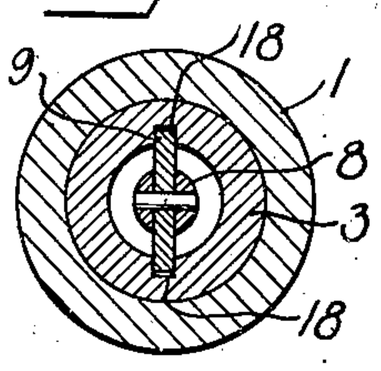
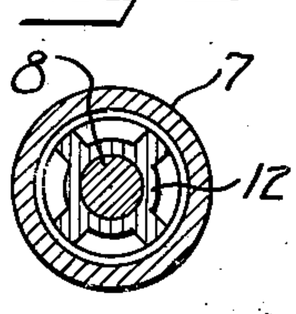


Fig-6



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Patented Dec. 19, 1939 2,183,825

UNITED STATES PATENT OFFICE

2,183,825

VALVE STRUCTURE

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Application March 3, 1939, Serial No. 259,554

7 Claims. (Cl. 277—25)

This invention relates to the art of valve structures for gas stoves.

The type of valve structure now under consideration comprises inlet and outlet openings and in such valve structures heretofore it has been the practice to set the size of the discharge orifice which would then remain the same for all of the sizes of the variable inlet opening. With such structure and manner of operation, the reduction in the size of the inlet means a corresponding decrease in pressure between the inlet and outlet and likewise a decreased velocity at the outlet orifice. The result is a reduction in air entrainment and a sluggish flame lacking in heating efficiency.

In an attempt to improve this situation, there have been devised valve structures with a plurality of discharge orifices of different sizes corresponding with the different positions of the inlet valve. But such a valve structure obviously involves considerable increase in cost.

The object of the present invention is to devise a valve structure in which the velocity of flow at the discharge orifice may be varied without any reduction of pressure between the inlet and the discharge orifice.

More specifically, the object of the present invention entails the provision of an adjustable valve at the single discharge orifice while maintaining a pressure between said inlet and outlet at least corresponding with the degree of opening at the outlet orifice at any given time.

A further object is to devise such a valve structure in which there is provided a unitary means for simultaneously manipulating the valves at the inlet and outlet openings.

Another object is to devise such a valve structure in which the same can be operated in either direction of rotation, with an improved relative arrangement of the several positions of adjustment.

A still further object is to devise such a valve structure that still maintains the conventional and accepted design of the valve body in general and that entails only reasonable cost in manufacture.

Other objects will appear from the following description and claims when considered together with the accompanying drawing.

Figure 1 is a sectional view of my improved valve structure;

Figure 2 is a view taken on line 2—2 of Figure 1;

Figure 3 shows in elevation the panel with the several positions of the valve handle marked thereon;

Figure 4 is an end elevation of the valve structure itself with the handle removed;

Figure 5 is a view taken on line 5—5 of Figure 1;

Figure 6 is a view taken on line 6—6 of Figure 1;

Figure 7 is an elevation of the needle valve and its control member;

Figure 8 is an end view thereof;

Figures 9 and 10 are views of the cam member;

Figures 11 and 12 are views of the centralizer;

Figures 13 and 14 are side elevations of the valve structure viewed at ninety degrees to each other.

It is to be understood that the present form of disclosure is merely for purposes of illustration and that there may be devised various modifications without departing from the spirit of the present invention, as herein set forth and claimed.

Referring to the accompanying drawing, the valve body 1 has the inlet 2 and the rotatable plug valve 3 for controlling the flow therethrough. As will be observed from Figures 2 and 3, this valve is formed so as to provide three fully open positions and a closed position. The valve 3 is maintained in assembly by the coil spring 4, the outer end of which abuts against a latching washer 5 so as to resiliently hold the same against the cap 6 secured to the valve body 1, by screws 13, as indicated in Figures 13 and 14. The washer 5 is carried by the rotatable stem or shaft 14 of the valve and has raised portions 15 adapted for engagement in corresponding radially extending slots 16 in the cap 6 so as to determine the several positions of the valve and to indicate the same by a clicking sound as these parts come into engagement with each other. These several positions are those indicated visually on the panel P in Figure 3.

The outlet end of the valve body 1 has the orifice cap or hood 7 in screw threaded engagement with the reduced end portion thereof, the cap 7 having the discharge outlet or orifice 17 with which the needle valve 8 co-operates. The needle valve 8 is provided at its rear end with the flat control member 9 diametrically thereof, and the member 9 is capable of straight-line, axial movement in diametrically disposed grooves 18 in the valve 3, as indicated in Figures 1 and 5. Thus the valve 8 will turn with the valve 3 but will have axial, slidable movement relatively thereto, as will more fully appear below.

The control member 9 has its forward edge formed with the shoulder portion indicated at 19 for co-operation with the cam member 10 which is mounted within the valve body 3 and through which the control member 9 extends. The control member 9 is held in operative engagement with the cam member 10 by the coil spring 11 which bears at one end against a shoulder 35 formed in the axial bore 36 of the valve plug, and I have provided the centralizer open disk 12 in the orifice cap 7 for the purpose of maintaining the movement of the needle valve 8 along a straight line and centrally of the orifice 17. As indicated in Figures 6 and 11, the centralizer 12, as here shown, has four prongs.

When my valve structure is installed, the cap 7 will be set with respect to the needle valve 8 so as to establish an orifice corresponding to "low" position of the flow control means. Thereafter there will be no adjustment of the cap 7 which thus remains in fixed position, but variations in the size of the orifice 17 will thereafter be effected solely by rotation of the handle 20 for operating the valve 3.

For instance, with the handle 20 occupying position marked "off", there will be no flow of gas through the valve; but when the handle is turned to "high", or "medium", the needle valve 8 will be automatically and simultaneously adjusted accordingly so as to vary the size of the orifice 17. However, the pressure back of the orifice 17 will be the same for all open positions of the valve 3. Likewise when the handle 21 is moved from either "high" or "medium" position to "low" position, the orifice 17 will be correspondingly reduced by automatic and simultaneous adjustment of the needle valve 8, but without any reduction in the pressure back of the orifice 17, due to the fact that operation of the valve to increase or decrease the inlet flow of gas automatically regulates the size of outlet correspondingly. Thus the velocity at the outlet orifice will be automatically regulated in accordance with the size of the orifice 17.

Thus I am enabled to obtain multiple flow control with but a single outlet or orifice, at which point alone the control of flow and hence velocity is accomplished and without any reduction in the pressure between the inlett 2 and outlet 17.

The amount of flow is controlled by the height of the predetermined off-sets 21, 22 and 23 of the cam 10 which correspond respectively to the three positions of the valve 3 in regulation of the flow, namely "high", "low", and "medium". There is a rise of twenty-five one-thousandths of an inch between low and high positions and from low to medium position a rise of about half that much. "High" elevation 21 also serves as the elevation for "off" position. The narrow spaces 24, 25 and 26 between the cam elevations constitute inclines to facilitate movement of the control member from one elevation to another.

The valve 3 can be rotatably operated in either direction and the cam 10 is so constructed and arranged that the valve must always be turned from "off" position to either "high" or "medium" position, as will be seen from Figure 3, and can not be turned from "off" position directly to "low" position. In this way, the danger of the gas failing to be lighted is reduced to a minimum if not eliminated.

From Figure 2 it will be seen that except when the valve 3 is closed, there will be permitted a flow of gas through the valve structure because of the relatively large size of the inlet 2 as compared with the two smaller closed portions between the ports of the valve member 3. Thus the gas will not be shut off while turning the valve between the "high", "low" and "medium" positions, but the only time when the gas will be completely shut off will be when the valve occupies "off" position.

It should be explained that although the pressure at the orifice will build up somewhat when the needle valve is in restricted position, as compared with the pressure during fully open position, and thus the pressure is not absolutely constant, yet it is considered to be substantially so.

With my device, there is obtained better air entrainment and consequently a better flame. Also, there is realized a saving in gas consumption because of the increased efficiency of the flame produced with my valve structure.

While my present improved valve structure is especially useful in a gas stove, yet it is to be understood that it is capable of more general use and the scope of the present invention is to be interpreted accordingly.

What I claim is:

1. A valve structure comprising a housing having a passage therethrough with inlet and outlet openings, a rotatable valve for said inlet opening, a tapered reciprocable valve for said outlet opening, said valves being co-axial and said outlet valve being reciprocably and non-rotatably coupled to said inlet valve, cam means in said housing co-operating with said outlet valve to produce reciprocating movement thereof as the valves are rotated, said valves having a plurality of rotary positions, said cam means providing an axial position of said outlet valve for predetermined flow in each of said positions, said inlet valve having a closed position and a plurality of substantially fully open positions, one for each of the operative positions of the outlet valve.

2. A valve structure comprising a housing having a passage therethrough with inlet and outlet openings, a rotatable valve for said inlet opening, a tapered reciprocable valve for said outlet opening, said valves being co-axial and said outlet valve being reciprocably and non-rotatably coupled to said inlet valve, cam means in said housing co-operating with said outlet valve to produce reciprocating movement thereof as the valves are rotated, said valves having a plurality of rotary positions, said cam means providing an axial position of said outlet valve for predetermined flow in each of said positions, said inlet valve having a closed position and a plurality of open positions, one for each of the operative positions of said outlet valve.

3. A valve structure comprising a housing having a passage therethrough and valve means for controlling the flow through said passage, said valve means having a closed position and a plurality of open positions including a minimum flow position and a plurality of positions of greater flow, rotatable actuating means for said valve means having positions corresponding to each of said valve positions, and being rotatable in either direction to move said valve means from any one to any other of said positions, the positions of said actuating means corresponding to said positions of greater flow being arranged between the positions corresponding to closed position and minimum flow position when said actuating means is turned in either direction.

4. A valve structure comprising a housing having a passage therethrough with inlet and outlet openings, separate valves for said openings, the

outlet valve having a plurality of positions each providing a predetermined flow, the inlet valve having a closed position and a plurality of open positions, one for each of the operative positions of the outlet valve, operative means of connection between said valves whereby operation of the inlet valve will effect operation of the outlet valve for automatically and definitely effecting the individual predetermined positions of the outlet valve, said operative means of connection including cam means having dwell portions each corresponding to a position of said outlet valve for predetermined flow in each of said positions, and means for operating said inlet valve.

5. A valve structure comprising a housing having a passage therethrough with inlet and outlet openings, a rotatable valve for said inlet opening, a reciprocable valve for said outlet valve opening, said valves being co-axial and having operative means of connection whereby rotation of said inlet valve will automatically and definitely effect individual and predetermined positions of the outlet valve, said operative means of connection including offset cam means with dwell portions providing an axial position of said outlet valve for predetermined flow in each of said positions, said inlet valve having a closed position and a plurality of substantially fully open positions, one for each of the operative positions of the outlet valve, and means for operating said inlet valve.

6. A valve structure comprising a housing having a passage therethrough with inlet and outlet openings, separate valves for said openings, the outlet valve having a plurality of positions each providing a predetermined flow, a limited number of said positions being preselected, the inlet valve having a closed position and a plurality of open positions, including a plurality of contiguous positions for each of said preselected positions, and one open position for each of said other positions of said outlet valve, operative means of connection between said valves whereby operation of the inlet valve will effect operation of the outlet valve for automatically and definitely effecting the individual preselected positions of the outlet valve by such operation of the same, and means for operating the inlet valve.

7. A valve structure comprising a housing having a passage therethrough with inlet and outlet openings, separate valves for said openings, the outlet valve having a plurality of positions each providing a predetermined flow, a limited number of said positions being preselected, the inlet valve having a closed position and a plurality of open positions, including a plurality of contiguous positions for each of said preselected positions, and one open position for each of said positions of said outlet valve other than said preselected positions, operative means of connection between said valves whereby operation of the inlet valve will effect operation of the outlet valve for automatically and definitely effecting the individual preselected positions of the outlet valve by such operation of the same, means for operating the inlet valve and means for holding said valves in each of their preselected positions, said holding means being automatically actuated by the operation of said inlet valve.

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