

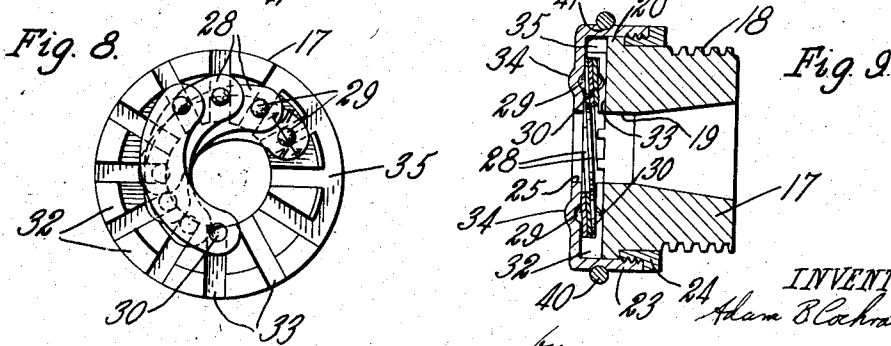
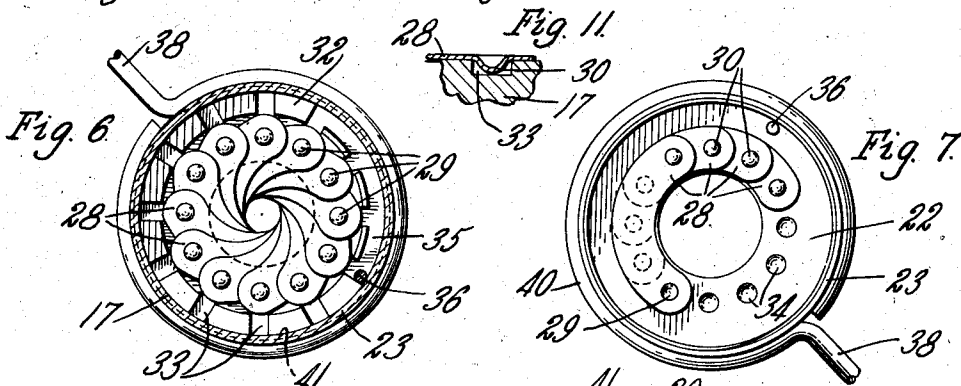
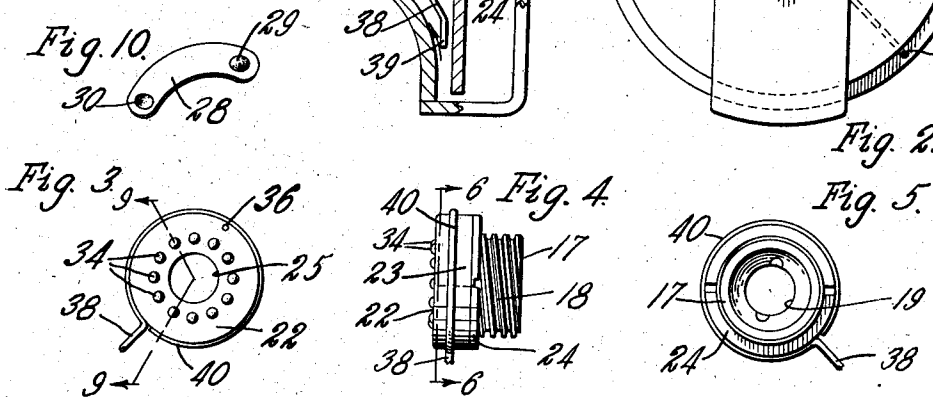
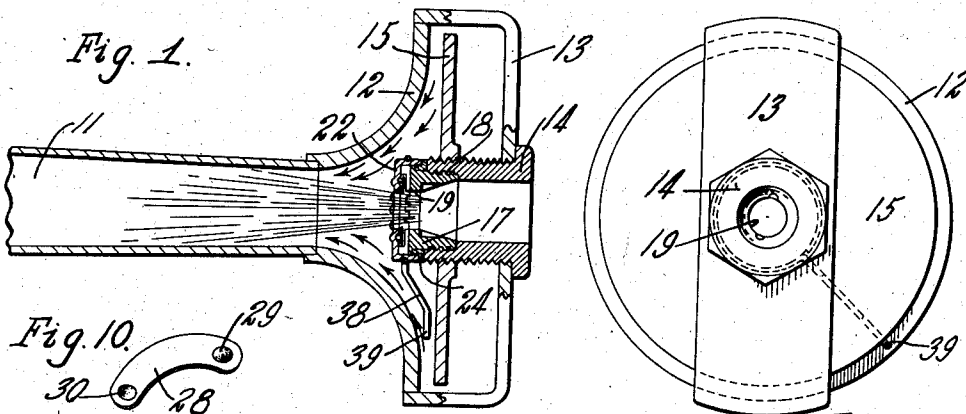
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GAS CONTROL VALVE

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GAS CONTROL VALVE

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3 Claims. (Cl. 158-118)

This invention relates to improvements in mixing devices for use in mixing two or more gases.

In supplying a combustible mixture of air and gas to a gas burner of the kind in which air is used under atmospheric pressure, it has been found possible to primarily mix with the gas only a limited portion of the air necessary for complete combustion of the gas, and additional secondary air for complete combustion is generally supplied to the primary mixture at the flame. It is well known that higher efficiency of combustion is obtained when a larger percentage of air is mixed with the gas in the primary mixing device, since secondary air cannot be as intimately mixed with the primary mixture as is desirable for the most efficient combustion.

The objects of this invention are to provide a mixing device which is so formed as to produce a jet of gas of the correct shape or form to enable it to mix with a larger percentage of air than has been the case with burners heretofore made; also to provide a mixing device of this kind having an adjustable discharge aperture for the gas and which in its different adjusted positions, always forms an orifice corresponding approximately to the cross section of the portion of the mixing tube with which the gas jet contacts, and to restrict the discharge of gas to such orifice; also to provide a mixing device of this kind which may be arranged at the discharge end of the gas supply passage or duct and which is adjustable by turning one of the outer shell or housing members containing an iris diaphragm, so that no opening through which an adjusting member extends into the housing is necessary, thus also avoiding the escape of gas through such opening; also to improve the construction of gas devices of this kind in other respects hereinafter specified.

In the accompanying drawing:

Fig. 1 is a fragmentary central sectional view of a mixing device including improved means embodying this invention for controlling the supply of gas to the mixing device;

Fig. 2 is an end view thereof;

Fig. 3 is a face view of the discharge end of the gas control valve, removed from the mixing device;

Fig. 4 is a fragmentary side view thereof;

Fig. 5 is a face view of the gas receiving end of the control valve;

Fig. 6 is a sectional view on line 6-6, Fig. 4, on an enlarged scale;

Fig. 7 is a view showing the interior of the adjustable housing member of the gas control

valve showing some of the leaves or segments in their operative positions in the housing member;

Fig. 8 is a similar view of the stationary or fixed housing member of the gas control valve showing some leaves or segments in place thereon;

Fig. 9 is a central sectional view on line 9-9, Fig. 3;

Fig. 10 is a perspective view of one of the leaves or segments;

Fig. 11 is a fragmentary sectional view on an enlarged scale on line 11-11, Fig. 8.

This invention may be applied to any mixing device for mixing two or more fluids and in the particular construction shown in the drawing, the device is shown as applied to a mixing device for gas burners, such as shown in the patent to Roberts No. 1,809,425 of June 9, 1931. This mixing device includes a mixing tube 11, only one end of which is shown in Fig. 1, and which preferably tapers toward the receiving end thereof. To the smaller end of the tube a bell-shaped shell 12 is preferably secured. The larger open end of this shell receives air and directs the air into the mixing tube as shown by the arrows in Fig. 1. This bell, in the construction shown, has a yoke or strap 13 secured thereto, which supports a sleeve or duct 14, the outer end of which may be suitably connected with a supply of gas. Preferably, the strap 13 has a threaded central hole in which the duct or short tube 14 may be secured by providing a corresponding thread on the outer surface thereof, and an air control plate or disk 15 preferably has a threaded engagement with the threaded exterior of the sleeve 12 so as to permit this disk to be moved toward and from the bell-shaped shell 14 by turning the plate 15 relatively to the sleeve 14, to regulate the amount of air entering the shell. Any other means for regulating the supply of air to the mixing device may, of course, be employed, if desired.

Heretofore, it has been customary to provide adjustable valves of various kinds at the discharge end of a gas supply duct, such as the sleeve 14, so that the amount of gas admitted to the mixing device may be regulated. In order to provide the most efficient mixing of air with gas, it is, however, necessary to have the gas discharged into the mixing device in the form of a jet which is directed into the mixing tube 11 so as to form with the walls of this tube a very acute angle. When this type of jet enters the mixing tube it draws with it the maximum quantity of air, so that less secondary air is necessary

to complete combustion. In mixing devices heretofore made, the valves for controlling the discharge of gas to the mixing tubes generally discharged jets of varying cross sectional shapes, depending upon the valve openings, the shapes of the jets being materially changed by adjusting the valves, so that even if such valves formed a correct jet for one discharge opening of the valve, the jet would be deformed by adjustment of the valve. Still other valves were objectionable for the reason that in addition to discharging gas through the discharge orifice, they permitted escape of gas through other openings in the valve housings, which gas would mix with the incoming primary air and thus reduce the amount of primary air that could be mixed with the gas in the mixing device, which in turn reduced the efficiency of combustion. In my improved iris diaphragm valve, I provide a gas discharge orifice which is always approximately circular in cross section, so that gas jets discharged therefrom during all adjustments of the valve form with the mixing tube acute angles such as provide for the maximum injector action of the jet of gas and also my improved valve eliminates discharge of gas through the side of the housing of the valve.

My improved valve includes a nozzle or housing part 17, which is suitably secured to the discharge end of the sleeve 14 or other gas supply duct and for this purpose in the particular construction shown, the nozzle is provided with a screw threaded portion 18 adapted to engage a corresponding internally threaded part of the sleeve 14. The inner wall of the nozzle 17 is preferably tapered and provided with a discharge aperture 19, preferably of smaller diameter than the internal diameter of the sleeve 14. This nozzle 17 forms a part of the housing of my improved valve and is provided near the discharge end thereof with an annular outwardly extending flange or shoulder 20 which cooperates with another housing member or shell 22, which is of cup-shaped form and the cylindrical portion or flange 23 of which is rotatably mounted on the nozzle portion 17 of the housing. In order to rotatably hold these two parts of the housing in correct relation to each other, the end portion of the flange 23 is screw threaded and engages with a threaded sleeve or member 24, which engages the shoulder or flange 20 to hold the housing part 22 in correct relation to the nozzle 17, and at the same time to permit rotary adjustment of the housing part 22 about the axis of the valve. The adjustable housing part 22 is provided with a central aperture 25 which is in registration with the aperture 19 of the nozzle 17. The connection described between the two housing parts not only permits adjustment of one part relatively to the other while holding the parts against separation, but at the same time, the connection is substantially gas-tight, so that gas entering the valve-housing can escape only through the aperture 25 thereof. Any other means for connecting the two housing parts in such a manner as to permit adjustment of one part relatively to the other part about the axis of the valve, may be provided.

The control of the gas discharge orifice of the valve is obtained by means of a plurality of leaves or segments 28 which may be of any suitable or desired form, each leaf having a pivotal connection with one of the housing parts and a sliding connection with the other part so that each leaf may be moved toward and from the axis of the apertures 25 and 19 of the valve, as in an iris

diaphragm. In the particular construction shown, each leaf is provided with a projection 29 near one end thereof and extending outwardly beyond one face of the leaf, and near its other end, the leaf is provided with the projection 30 extending beyond the opposite face of the leaf. These projections may be of any suitable or desired form, and as shown in the drawing they are in the form of integral projections which, when the leaves are made of sheet metal, may be formed by pressing portions of the leaves outwardly by means of a die.

It will be noted in Fig. 9, that an annular space is formed between the discharge end of the nozzle 17 and the housing member 22 and within this space the leaves of the diaphragm may be arranged. The depth of this space is controlled by suitable spacing or separating means between the two housing members, such for example as an integral flange 32 projecting outwardly from the nozzle member 17, the outer end of which flange is engaged by the inner face of the housing member 22. Any other means may, however, be provided for forming the desired space for the leaves between the two housing members. The outer face of the nozzle member 17 of the housing is, in the construction shown, also provided with a series of substantially radially extending slots 33 which may be milled, or otherwise formed in the end of the housing member 17, and which may, if desired, extend through the flange or projection 32 for convenience in machining. Each of these slots is adapted to receive one of the two projections of a leaf 28 of the iris diaphragm, as shown in Figs. 6, 8, 9 and 11. The projection, on the other end of the leaf and on the opposite face thereof, extends into a corresponding depression 34 in the inner surface of the housing member 22, as shown in Figs. 7 and 9. These depressions may be formed in the housing member in any suitable manner, for example, by stamping, drilling or otherwise. Consequently, when the leaves of the diaphragm are arranged in their correct relation to the two parts of the housing, the turning of one housing member relatively to the other will result in changes of position of each leaf toward or from the axis of the valve so that the discharge orifice of the valve is correspondingly controlled. In order to limit the extent to which the members of the housing can be adjusted relatively to each other, an arcuate recess 35 may be formed in the outer portion of the housing member 17, and a pin or projection 36 secured to the other housing member and extending into this recess will contact with the ends of the recess to limit the extent to which the housing member 22 may be turned relatively to the housing nozzle 17. Any other means for limiting the relative movement of the housing members may, of course, be employed.

Any suitable means may be provided for adjusting the outer housing member 22 relatively to the nozzle portion 17 from the exterior of the mixing device, and I preferably provide a handle portion 38 which may be made of wire or similar material and the end 39 of which extends through the space between the bell-shaped part 12 of the mixing device and the adjustable plate 15. The inner portion of the handle 38 may be in the form of a spring clamp 40 encircling the housing member 22, and preferably arranged in a groove 41 in this member. This construction provides a frictional engagement of the housing member 22 by the inner end of the handle 38 and also makes it possible to move the handle relatively to the

housing member 22 so that the handle will extend outwardly in the desired relation to the housing member. By providing a frictional engagement of this kind, damage to the valve by the use of excessive force on the handle 38 is avoided, since such excessive force would result in a sliding of the looped portion of the handle in the groove 41. Other means for providing for the adjusting of the movable housing member may, of course, be provided.

The gas control valve shown has the advantage that the jet of gas discharged from the valve is always of approximately circular cross section to conform with the cross section of the mixing tube and to impinge against the inner wall of the mixing tube at the desired acute angle and the valve, furthermore, is of such construction that the housing is provided with no opening in the side thereof for adjustment of the diaphragm. Consequently, the primary air flowing to the mixing device as indicated by the arrows in Fig. 1 will not become mixed with gas discharged through such opening in the housing. The valve further has the advantage that it is of simple and sturdy construction and is thoroughly reliable in operation. The fact that the handle is frictionally held on the adjustable housing member is desirable in that the position of the handle with reference to the mixing device can be regulated as may be desired. The diaphragm can be very easily adjusted by simply moving the end 39 of the handle in either direction until the desired mixture is obtained and no tools of any kind are necessary to effect this adjustment. Furthermore, this adjustment can be made with a high degree of accuracy since the outer end of the handle moves through a considerable distance to cover the full range of adjustment of the diaphragm. Consequently, a burner provided with a gas valve of this type can be readily adjusted for use with a variety of different fuels because of the wide range of adjustment of the valve.

I claim as my invention:

1. An air and gas mixing device for gas burners, including a mixing tube having an enlarged air receiving end and a portion of smaller cross sectional area adjacent thereto, a gas discharge passage spaced from said mixing tube for conducting gas to said mixing device, a plate adjustable toward and from said air receiving end to control the amount of air entering the mixing tube, a gas control orifice arranged on the discharge end of said gas passage, and means for adjusting said orifice to control the discharge of gas to said mixing tube, said adjusting means including a part extending outwardly into the space between the edge portions of said air receiving end and said plate and frictionally connected with said adjusting means.

2. A gas valve including a housing part having a passage for gas extending lengthwise there-through, a shell of cup-shaped form mounted on one end of said housing part and having a por-

tion extending substantially parallel to said end of said housing part and having an aperture in alinement with said gas passage, and having an integral continuous annular flange engaging a peripheral portion of said housing part adjacent to said end and rotatably adjustable relatively to said housing part, said end of said housing part being provided with a plurality of grooves extending from said passage to the periphery of said housing part and having their ends closed by said flange of said shell, said portion of said shell which extends parallel to said end being provided with a plurality of depressions arranged about said aperture therein, means for holding said shell against endwise movement relatively to said housing part, and a plurality of leaves arranged in the space between said housing part and said parallel part of said shell and each having a projection on one face thereof entering into a groove of said housing part and a projection on the other face thereof entering into a depression in said shell, whereby rotary adjustment of said shell about said housing part adjusts said leaves toward and from the axis of said passage to control the flow of gas therethrough.

3. A gas valve including a housing part having a passage for gas extending lengthwise there-through, a shell of cup-shaped form mounted on one end of said housing part and having a portion extending substantially parallel to said end of said housing part and having an aperture in alinement with said gas passage, and having an integral continuous annular flange engaging a peripheral portion of said housing part adjacent to said end and rotatably adjustable relatively to said housing part, an integral flange projecting outwardly from said end of said housing part at the peripheral portions thereof in a direction parallel to the axis of said gas passage and to said flange of said shell, said end of said housing part being provided with a plurality of grooves which extend from said passage through said flange of said housing part and terminate at a peripheral portion of said housing part and having their ends closed by said flange of said shell, said portion of said shell which extends parallel to said end being provided with a plurality of depressions arranged about the aperture therein, said flange holding said shell in spaced relation to said end of said housing, means on said housing cooperating with said flange of said cap for holding said shell against movement outwardly beyond the end of said housing, a plurality of leaves arranged in the space between said shell and said housing part and within said flange of said housing part and each having a projection on one face thereof entering into a groove of said housing part and a projection on the other face thereof entering into a depression of said shell, for adjusting said leaves toward and from the axis of said passage during rotary adjustment of said shell relatively to said housing part.

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