Jan. 11, 1944. W. S. GUTHRIE 2,338,810

GAS BURNER ASSEMBLY

Filed June 24, 1942

Fig. 1

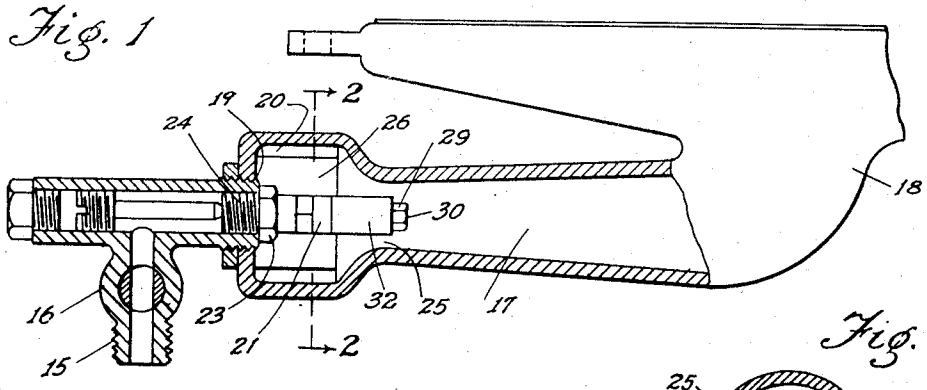


Fig. 2

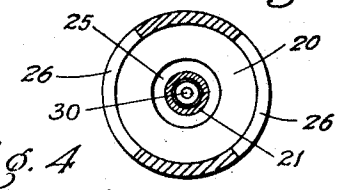


Fig. 3

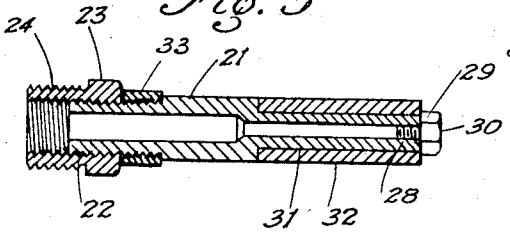


Fig. 4

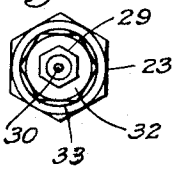


Fig. 5

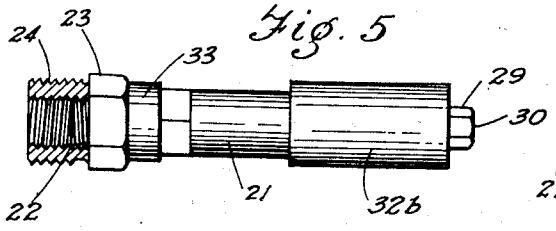
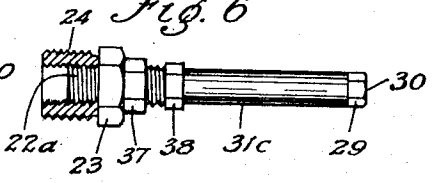


Fig. 6



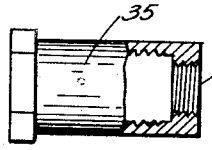


Fig. 7

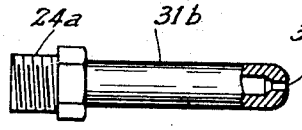


Fig. 8

Fig. 9

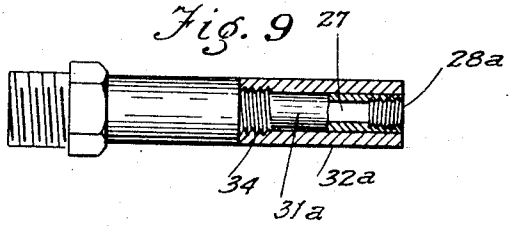
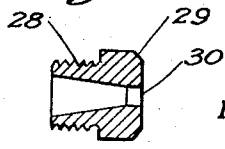


Fig. 10



INVENTOR.

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GAS BURNER ASSEMBLY

William S. Guthrie, Los Angeles, Calif.

Application June 24, 1942, Serial No. 448,309

7 Claims. (Cl. 158—118)

My invention relates to gas burners, and more particularly to the conventional type of appliance burners usually employed with kitchen ranges, space heaters, water heaters, house warming furnaces and other appliances.

This application is a continuation in part of my previous applications Serial No. 252,224, filed January 21, 1939; and Serial No. 339,293, filed June 7, 1940; and Serial No. 433,860, filed March 9, 1942; and Serial No. 436,393, filed March 27, 1942.

One object of the invention is to provide a burner of the class specified with the burner operation characteristics requisite for efficient combustion of the gas for the varying operating conditions of the burner without the use of air shutters or other adjustable air valves for determining the air input for the burner.

Another object is to provide a cheaply constructed nozzle which may be embodied in such burners of various types and sizes now in use without requiring a different form of nozzle for each and every size and type of burner.

Another object is to improve such appliance burners which are in use at the present time as well as those which may hereafter be manufactured, by making them adaptable for the various utility gases throughout the country at a low cost and without the necessity of using air shutters for determining the air input for the burners.

The above objects may be accomplished cheaply by projecting a fuel supply device into the throat of a properly designed mixing tube to provide an air metering passage within the throat for determining substantially entirely the air input for the burner. My specially designed nozzle or fuel supply device is made of such form and size where it enters the throat as will permit the discharge end thereof to be positioned at varying distances inwardly beyond the outer end of the throat with uniformity in the air-gas ratio. This type of construction provides the tolerance necessary to assemble the parts at a low cost and makes it possible to employ one length of nozzle for embodying the invention in many different burners that are in use at the present time.

The design of mixing tube construction suitable for use with my invention is provided with a gas expanding portion inwardly beyond the throat which has a cross section area of a size larger than the cross section area of the air metering passage as will permit the gas to expand requisite for efficient combustion at the burner. Many of the conventional appliance burners are provided with such mixing tube construction, which makes it possible to embody my invention therein without materially changing the usual line of production.

The air admittance means is preferably located ahead of the throat and of such size as will permit the inspirating action of the throat to automatically entrain the air input requisite for efficient flexibility in the burner operation characteristics with varying gas pressure. This construction causes the primary air stream to flow at high velocity through the air metering area of the throat, which reduces the possibility of the gas escaping into the atmosphere from the air mixer and also reduces the possibility of foreign matter interfering with the flow of the primary air supply.

The conventional appliance burners of the class specified are usually equipped with detachable orifice fittings which may be provided with an aperture to receive my specially designed nozzles and thus obviate the necessity of having nozzles provided with many different sizes of base ends to fit the various sizes and types of burners.

Other objects and advantages of my invention will appear in the following description with reference to the accompanying drawing which form a part of this specification, in which:

Fig. 1 is a side longitudinal vertical view partly in section, of a burner assembly including a conventional space heater cock combined with one form of my adjustable nozzle. Fig. 2 is a sectional view on the line 2—2 of Fig. 1. Fig. 3 is an enlarged sectional view of the nozzle shown in Figs. 1 and 2. Fig. 4 shows an end view of the same nozzle. Fig. 5 shows a side view of a similar nozzle equipped with a larger sleeve. Fig. 6 shows a side view of a modified form of adjustable nozzle. Fig. 7 shows an ordinary adjustable cock hood or orifice fitting that has been provided with a threaded aperture to receive my nozzles. Figs. 8 and 9 show side views partly in section of modified forms of my nozzles, which may be combined with various forms of cocks, including the cock shown in Fig. 1. Fig. 10 shows an enlarged sectional view of the detachable fitting embodying the restricted orifice at the discharge end of the nozzles.

In the embodiment of the invention illustrated in Figs. 1–4 and 10, a source of gaseous fuel may be connected to the threaded inlet 15 of an ordinary fuel supply valve or gas cock 16 which discharges gaseous fuel into the mixing tube 17 that leads to the burner 18.

My specially designed nozzle 21 is provided with screw threads 22 at its inlet end which adapts

it to be inserted into the threads provided in the adapter fitting which may be any ordinary orifice fitting **23**. This fitting may be threaded at **24** as usual, which adapts the same to be inserted into the outlet portion or member of the cock. The discharge end of the nozzle is preferably positioned within the throat of the mixing tube at a point which is either at or inwardly beyond the most restricted portion of the throat **25**, which comprises an important feature of my invention.

The air chamber **20** has two side ports **26** located ahead of the throat and through which air is entrained and supplied to the throat by the flow of the gas stream issuing from the restricted orifice **30** at the discharge end of the nozzle. The air stream flows at high velocity through the restricted throat and when this uncarbureted air reaches the discharge end of the nozzle it flows with the gas at reduced velocity which permits the gas to expand as it flows through the expanding mixing tube **17** to the burner.

The mixing tube has a gas expanding portion located inwardly beyond the throat which has a cross section area of at least twice the size of the cross section area of the air metering passage around the fuel supply device as clearly shown in the drawing. This construction economically provides adequate means for expanding the gas requisite for efficient combustion at the burner and comprises a valuable feature of the invention.

In the cheaper type of air shutter burners the carbureted air may escape into the atmosphere through the crevices where the shutter joins the mixer. The latter type of burners as commonly used in space heaters are often equipped with a sleeve type of air shutter, which may be more susceptible to the above undesirable condition than some of the other types.

The cheaper type of mixing device may be made as efficient as the more costly type when my specially designed nozzle is embodied therein. The burner shown in the drawing to illustrate the invention is of the cheaper type which has lateral air admittance means located ahead of the throat at a point inwardly from the extremity of the air chamber.

I have provided several forms of nozzles especially suitable for specific purposes. The conventional burners of the class specified may be equipped with either form of my specially designed nozzles to function efficiently with liquefied petroleum and the several utility gases having different B. t. u. content, as will be more fully explained as the specification progresses.

My specially designed servicing nozzle, shown in Figs. 1 to 5, is especially flexible for use with the varied types and sizes of burners of the class specified which are now in use, and therefore, substantially reduces the number of forms of nozzles that otherwise may be required for servicing these burners. The usual orifice fittings **23** of the different burners may be drilled and tapped to receive the threaded end **22** of the nozzle.

Since the orifice fittings vary in size and threads, I have provided the inlet end of my nozzle with the threads **22** which may usually be inserted into an aperture that may be provided in the different orifice fittings to make one size of nozzle fit into a considerable number of various burners.

When a less lengthy nozzle may be employed for some of the burners, the fitting or spacer **33** interposed between the nozzle **21** and the fitting **23** may be eliminated. The fitting **33** may or may not be threaded to fit the threads **22** of the nozzle. A lock nut **37** shown in Fig. 6 may be substituted for the fitting **33** to provide means for more accurately adjusting the length of the nozzle.

The air supply for the different burners may be adjusted by employing a suitable detachable sleeve of such form and smaller size than the throat as will provide a restricted air metering passageway around the sleeve for determining the air input for the burner. A tubular sleeve **32** may be employed for this purpose. A larger sleeve, similar to the sleeve **32b** shown in Fig. 5, may be required to restrict the throat of burners having large throats. The sleeves may be secured in position around the stem of the nozzle either by means of screw threads or by the hexagonal orifice fittings **29**.

The orifice **30** may be restricted to determine the gas input for the burner and the usual needle valve may be eliminated; thus the adjustment of the air and gas supply may not be easily changed by those unskilled in the art.

The stem **31** of the nozzle, clearly shown in Fig. 3, may be sized to form a restricted air metering passageway at the throat around the nozzle for determining the air input for some of the burners without the use of a sleeve, as will be apparent. This type of nozzle may be combined with the adjustable orifice cocks by similarly providing a threaded aperture **36** in the hood or fitting **35**, shown in Fig. 7, to receive the threaded end **22** of a suitable nozzle.

I have also provided a specially designed sleeve equipped nozzle, shown in Fig. 9, which is flexible for use with the various utility gases having differene B. t. u. content. This nozzle may be combined with various forms of cocks including the cock **16** shown in Fig. 1. The sleeve **32a** may be secured in position around the nozzle by screw threads **34**, so that when the detachable orifice is removed the sleeve will remain secured to the nozzle. The restricted passageway **27** may be threaded at **28a** to receive the threaded end **28** of the orifice fitting **29** shown in Fig. 10. A similar restricted fuel passageway may be provided in the nozzle **21** as clearly shown in Fig. 3. However, this passageway may not be restricted to determine the flow of the gas in nozzles that are used for servicing the burners in localities where the B. t. u. content of the gas is uniform.

The base end of either form of the nozzles may or may not be provided with a detachable adapter fitting, as desired. The restricted passageway **27** is preferably restricted to determine the flow of manufactured gas input for the burner when used in the low pressure areas with the orifice fitting removed. An orifice **30** may be secured to the end of the nozzle by means of screw threads. The orifice is preferably restricted to determine the flow of natural gas input for the burner when used in the low pressure areas.

The exterior size or diameter of the stem **31a** of this nozzle is preferably sized to restrict the throat properly to provide the normal air input for natural gas when the sleeve **32a** is removed, and the diameter of the sleeve is preferably sized to restrict the throat properly to provide the normal air input for either mixed or manufactured gas.

When the appliance burners are equipped with this nozzle thus constructed, the needle valve may be adjusted to provide the air-gas ratio requisite for complete combustion with the different gases in the higher pressure areas. The burners

thus equipped may be adapted for either manufactured or mixed gas by removing the orifice 30; and for natural gas by removing the sleeve 32a. Thus the burners may be made adaptable for the different utility gases.

When it is desired to install my nozzles in burners used with liquefied petroleum gases, it is preferred to employ one of my more simple nozzles similar to that shown in Fig. 8. This nozzle may be made with a stem 31b and orifice 30a properly sized to provide the normal air and gas input for many of the burners for use with any particular kind of standard appliance gas without the use of a needle valve. A similar nozzle may be provided with a detachable orifice 30 and detachable adapter fitting when desired.

The stem portion of the nozzle, which enters the throat to control the air supply, is preferably made substantially uniform in diameter to prevent the cross section area of the throat being varied sufficiently to cause a perceptible variation in the air-gas ratio with a variation in the position of the discharge end of the nozzle inwardly from the throat.

The uniform functioning of the burner with a variation in the position of the discharge end of the nozzle inwardly from the throat permits the end of the nozzle being positioned more inwardly from the throat of some of the burners than it is in others with uniformity in the functioning of burners. Thus one length of nozzle may be used in a number of different sizes and types of burners.

The adjustable nozzle shown in Fig. 6 may have a substantially uniform stem 31c and a full length sleeve may be employed and likewise held in position by the orifice fitting 29. Similar screw threads 22a adapts the nozzle to be connected to and supported by various forms of gas cocks, including the cock 16 shown in Fig. 1. The hexagonal surface 38 facilitates the turning of the nozzle with a wrench or other tool. The length of this nozzle may be adjusted as desired and secured in position by the lock nut 37.

The conventional type of appliance burners are usually provided with mixing tubes having threaded or unthreaded apertures located ahead of the throat or at the outer end walls thereof which are adapted to receive the outlet of the cocks. This construction makes it possible to improve these burners cheaply with my specially designed high velocity nozzles to control or determine the air input for the burners without the use of the air shutters.

It will be apparent that I have devised new ways and means for cheaply utilizing the efficient operation characteristics of the Venturi throat, which is usually embodied in the modern appliance burners of the class specified, for determining the air input for the burners so that the air-gas ratio is automatically maintained with variations in the gas pressure, and with variations in the projecting position of the discharge end of the fuel supply device. The nozzle and the sleeve are made smaller in exterior size than the fixed size of the throat, so that the outer flaring end of the throat may function efficiently in directing the flow of the primary air stream to the air metering passage provided around the fuel supply device.

When the conventional air shutter burners are equipped with my invention, it is preferred that the air shutter either be eliminated or opened sufficiently to permit the air metering passageway to determine substantially entirely the air input for the burner. The conventional appliance burners, when equipped with my invention, are flexible in automatically providing efficient combustion of the gas when the burner is operating with a very low fire as well as with intermediate and full fire. The nozzles may often be formed with tubing that may be secured to an adapter fitting as above described to cheaply provide a suitable fuel supply device for some of the burners, as will be apparent.

In combining my specially designed nozzle, which may or may not be sleeve equipped, with the conventional air mixer construction as above described, I have provided the burner operation characteristics that have long been sought without requiring air shutters for determining the air input for the burner, which eliminates the usual difficulties often encountered with the air shutters and reduces the possibility of the air-gas mixture escaping into the atmosphere from the air mixer. Therefore, the use of my invention in the conventional appliance burners of the class specified may avoid considerable servicing as well as increase the efficiency of many of the appliances, as will be apparent to those skilled in the art.

From the foregoing description it will be apparent that my invention may be embodied into other forms of burners, including top burners for ranges and other appliances in which the gas cock outlet enters the usual unthreaded aperture at the extremity of the air chamber.

It will be apparent that while I have shown certain details of construction for carrying my invention into effect, I am not necessarily limited to those details, and various changes therein and modifications thereof may be made within the scope of the appended claims, without departing from the spirit of my invention or sacrificing its advantages.

I claim as my invention:

1. In combination, a gas burner having a mixing tube leading thereto, said tube having a throat of fixed size, air admittance means located ahead of said throat, a fuel supply device projecting into the mixing tube within said throat so that an air metering passage is provided within the throat around said fuel supply device, said mixing tube having a gas expanding portion located inwardly beyond the throat that has a cross section area of at least twice the size of the cross section area of said air metering passage, and said air metering passage providing uniformity in the air-gas ratio with variations in the projecting position of the fuel supply device within said throat.

2. In combination, a gas burner having a mixing tube leading thereto, said tube having a throat of fixed size, enlarged air admittance means located ahead of the throat, a fuel supply device projecting within said throat so that an air metering passage is provided around the fuel supply device at the smallest cross section area of the throat, the cross section area of the fuel supply device in relation to the cross section area of said throat being such that the air metering passage has a substantially uniform size with variations in the projected position of the fuel supply device within the throat, said mixing tube having a gas expanding portion located inwardly beyond said throat, and said air metering passage having at most a 1 to 2 ratio in cross section area in relationship to the cross section area of said gas expanding portion.

3. In a gas burner assembly, a burner having an air mixer connected thereto, said air mixer having a mixing tube provided with a throat, air admittance means located ahead of said throat, a fuel supply device having a stem projecting within said throat, said fuel supply device having a detachable sleeve around said stem, said sleeve extending into said throat so that a restricted air metering passageway is provided around the sleeve within the throat, said mixing tube having a gas expanding portion located inwardly beyond said throat, and said gas expanding portion having a cross section area that is at least twice the size of the cross section area of said air metering passageway.

4. In a gas burner assembly, a burner having a mixing tube leading thereto, said tube having a throat provided with an enlarged outer end portion, air admittance means for supplying air to the throat, a fuel supply device having a stem projecting within said throat, said fuel supply device having a detachable sleeve around said stem where it projects into the throat so that an air metering passage is provided around said sleeve inwardly beyond the enlarged outer end portion of said throat, said mixing tube having a gas expanding portion located inwardly beyond said throat, and said gas expanding portion having a cross section area that is at least twice the size of the cross section area of said air metering passage.

5. In combination, a gas burner having a mixing tube leading thereto, said tube having a throat, air admittance means for supplying air to said throat, a fuel supply device projecting within said throat so that an air metering passage is provided around said fuel supply device, said mixing tube having a gas expanding portion located inwardly beyond said throat, said gas expanding portion having a cross section area that is at least twice the size of the cross section area of said air metering passage, said fuel supply device having a fuel passage adapted to meter the flow of gaseous fuel, and said fuel supply device having connecting means for affixing an orifice to its discharge end.

6. In combination, a gas burner having a mixing tube leading thereto, said tube having a throat, air admittance means located ahead of said throat, a fuel supply valve having an outlet member, a fitting being detachably connected to said outlet member, a fuel supply nozzle having an inlet end being secured to said fitting, said nozzle projecting within said throat so that an air metering passageway is provided around the nozzle, said mixing tube having a gas expanding portion located inwardly beyond said throat, and said gas expanding portion having a cross section area that is larger than the cross section area of said air metering passageway by a ratio of at least two to one.

7. In combination, a gas burner having a mixing tube leading thereto, said tube having a throat of fixed size, air admittance means of fixed and permanent size located ahead of said throat, a fuel supply device projecting into the mixing tube within said throat so that an air metering passage is provided within the throat around said fuel supply device, said air metering passage determining substantially entirely the air input to said burner, said mixing tube having a gas expanding portion located inwardly beyond the throat that has a cross section area of at least twice the size of the cross section area of said air metering passage, and said air metering passage providing uniformity in the air-gas ratio with variations in the projecting position of the fuel supply device within said throat.

WILLIAM S. GUTHRIE.