March 21, 1939. E. HASSIG 2,151,271

METHOD OF MAKING A PILOT LIGHT BURNER

Filed Dec. 5, 1935

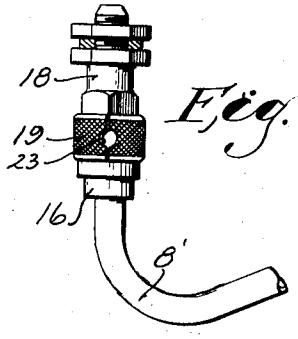


Fig. 3.

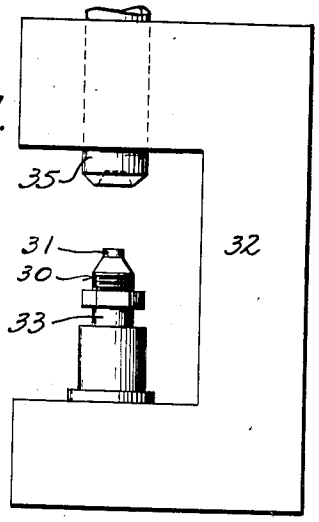


Fig. 4.

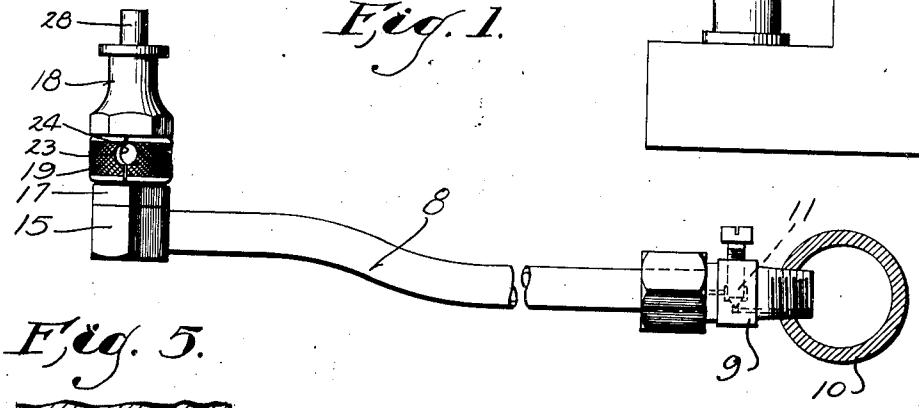


Fig. 1.

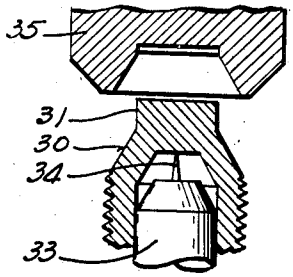


Fig. 5.

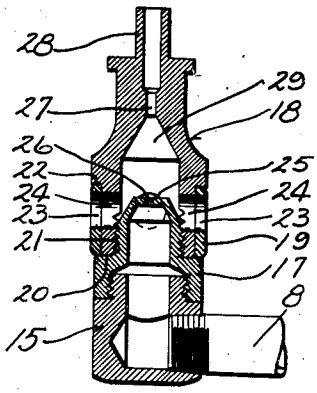


Fig. 2.

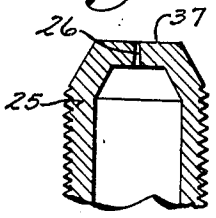


Fig. 7.

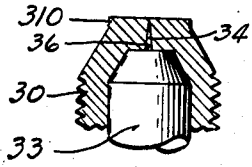


Fig. 6.

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METHOD OF MAKING A PILOT LIGHT BURNER

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Application December 5, 1935, Serial No. 52,996

1 Claim. (Cl. 29—157)

This invention relates to improvements in pilot light burners and methods of manufacture thereof.

It is the primary object of the invention to provide a novel and improved pilot structure in which the several parts are largely susceptible of manufacture in automatic screw machines to reduce expense, and are of such a design and process of manufacture as to greatly improve the character of the flame produced in the use of the pilot burner.

The dimensions, proportions, and general construction of a gas pilot burner are very critical. While the pilot is an inexpensive item in itself it may, if improperly constructed, become a source of danger or excessive expense. A flame which is readily extinguished is said to be a "soft" flame and is dangerous. Such a flame results if the orifice nozzle is not perfectly formed and accurately aligned, or if the proportions are wrong. A flame which is either unduly elongated or globular in form is usually a soft flame, and a burner which produces such a flame may be rendered moderately safe only by burning excessive quantities of gas. The ideal flame is pear-shaped and is a hard flame capable of resisting a very substantial wind with extremely moderate expenditure of gas, and capable of maintaining its height with little or no variation despite fluctuations in pressure in the gas main. To produce such a flame is one of the principal objects of this invention.

I have found that for gas stove pilot purposes the most desirable diameter of the gas admission orifice to produce a satisfactory flame is .010". This is materially smaller than the orifices previously used and is too small to be made in production by drilling. Moreover, orifice diameters of the order used in the preferred embodiment of this invention are so minute that the porosity of the brass commonly used in the construction of these devices is a factor. If even a single pore be intersected by the outlet marginal portion of the gas orifice, the gas jet will be deflected and the resulting flame will be a soft and undesirable flame. Accordingly it is an object of this invention to produce the gas orifice without drilling and in a manner which assures its accurate size, form, proportion and alignment.

In the drawing:

Figure 1 is a side elevation of a complete gas stove pilot structure embodying the invention.

Figure 2 is a view taken in vertical section through the burner head on an enlarged scale.

Figure 3 is a view showing a modified form of burner head.

Figure 4 is a fragmentary view of a device used in the production of a satisfactory orifice nozzle.

Figure 5 is a fragmentary detail view of an orifice nozzle part prior to its being acted upon by the device of Figure 4.

Figure 6 is a view similar to Fig. 5 showing the same part after the device of Fig. 4 has acted thereon.

Figure 7 is a fragmentary detail view on a very much enlarged scale showing the completed gas admission orifice.

Like parts are identified by the same reference characters throughout the several views.

The pilot assembly is supplied with gas through a feeder tube 8 mounted in a connector 9 which is screwed into the gas pipe 10 and controls the gas supply through the medium of a needle valve 11, all in a conventional manner. The feeder tube 8 may enter the pilot assembly through the side of a special fitting 15 as shown at Fig. 2, or the pipe 8' may be curved upwardly to enter the assembly vertically through the adaptor 16 (Fig. 3).

In either case the pilot assembly preferably includes an orifice nozzle fitting 17, a stack fitting 18, and an air ring 19. The parts 15, 16, 17, 18 and 19 are preferably designed for automatic screw machine manufacture.

The pilot stack fitting 17 has an internally threaded base screwed on to the adaptor 15 or 16. It has a deep shoulder at 20 beyond which there is an externally threaded portion 21. The pilot stack fitting 18 is threaded to the portion 21 of the nozzle fitting 17 and is seated against the shoulder 20. There is an opposing shoulder 22 on the stack fitting 18, and between the shoulders 20 and 22 the air ring 19 is confined against axial displacement.

The air ring comprises a split ring having apertures 23 which, by rotation of the ring, may be aligned to a greater or less degree with the air ports 24 in sides of the stack fitting 18.

Projecting centrally into the stack fitting between the air ports 24 is the nozzle 25 which is frusto-conical in form and has a gas admission orifice 26 in its blunt end. Directly in line with this orifice the chamber within the stack fitting 18 is sharply constricted to provide a Venturi opening at 27 beyond which extends a slightly enlarged stack or burner tube 28. The gas flame burns at the tip of the stack 28.

In Fig. 2 the parts are shown as nearly as possible in their proper proportions. The relative pro-

portions of the mixing chamber **29** in the stack fitting, and the length and diameter of the Venturi passage **27** have long been known in an approximate way, but it has not generally been recognized that the proportions of the gas admission orifice at **26** critically affect the dimensions and proportions of the remaining parts including the length of chamber **29**, the length and diameter of the Venturi passage **27**, and the length of the stack **28**.

I have found that for the general proportions illustrated, the orifice **26** should never exceed the approximate maximum diameter of .010''. If such is the approximate diameter of the orifice **26** its length should be about .050''. Its form is preferably slightly tapered from its inlet end to its discharge end. Its terminal margin is particularly critical and should be entirely symmetrical in outline and free of any pits or pores or turned edges which can affect the jet of gas issuing therefrom. Even a slight irregularity is sufficient to deflect the jet so that it will no longer be directed axially of the Venturi passage **27**.

An orifice of the maximum diameter of .010'' is too small to be made with a drill in production. Moreover, since the parts of pilot burners are ordinarily made of brass, and since brass is porous, the intersection of a drilled hole of such small size with a pore or pores in the brass at the orifice would necessarily produce an irregular outline which would deflect the jet of gas and would lead to an objectionably soft flame above the stack. Therefore I prefer to make my orifice nozzle by the process hereinafter described.

The blank delivered by the screw machine for the orifice fitting is shown at **30** in Fig. 5. It is imperforate and has a generally cylindrical projection at **31**. This blank is put into the press **32** shown in Fig. 4. A smooth mandrel **33** guides the work and supports a needle-like punch **34**.

The plunger **35** is then moved downwardly against the projection **31** to drive the work downwardly on to the punch. Upon the completion of this operation the blank is as indicated in Fig. 6, the projection **31** being flattened as shown at **310** and the punch having penetrated partly through the material of the blank to leave a tapered recess **36**. The operation has so compressed the brass as to destroy all open pores therein. The piece is then completed by removing the compressed end portion **310** to expose the tip of the recess **36**, thereby to form the orifice **26** in the flat terminal surface **37** of the frusto-conical nozzle **25** as shown in Fig. 7.

A pilot assembly constructed in accordance with the present invention will consistently deliver a hard flame with little or no variation in height despite variations in gas pressure. The orifice necessarily aligns the jet with the Venturi passage **27** and delivers gas at the proper rate, so that when the proper volume of air is admitted subject to the control of the air ring **19**, perfect combustion at the top of the pilot stack will occur.

I claim:

The method of making a pilot burner nozzle which consists in forming a hollow fitting of soft metal with one closed end, introducing a punch of circular cross section tapering to a minute diameter into the fitting, pressing the closed end of the fitting on to the punch under pressure adequate to close the pores of the metal adjacent the path of the punch and to uniformly densify such metal about the path of the punch, thereby forming a recess in the under surface of the closed end of said fitting, and subsequently removing the outer surface of the closed end of said fitting to expose the tip of said recess at a diameter so minute that pores, if present, would render the resulting orifice objectionably irregular and to finish about the remaining orifice the densified metal of said fitting, the resulting orifice being symmetrically circular in cross section with sharply defined walls free of pores and a diameter too small to be bored in commercial production.

EDWARD HASSIG.