

No. 697,768.

Patented Apr. 15, 1902.

W. J. WOODWARD.
GAS AND AIR MIXING BURNER.

(Application filed Sept. 4, 1901.)

(No Model.)

Fig. 1.

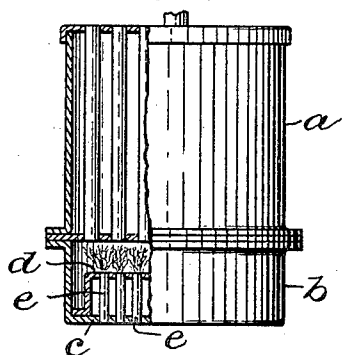


Fig. 2.

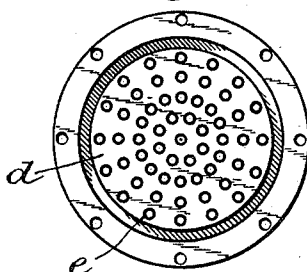


Fig. 3.

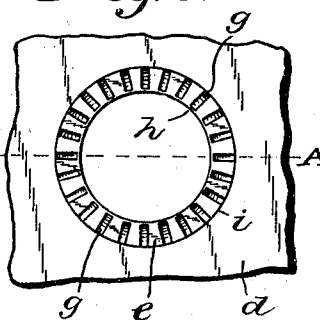


Fig. 4.

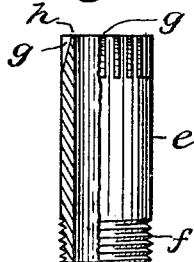


Fig. 5.

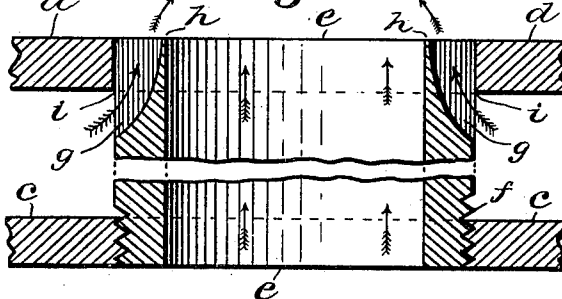


Fig. 6.

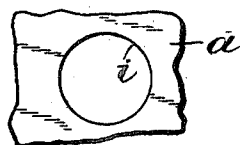
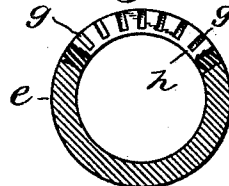


Fig. 7.



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UNITED STATES PATENT OFFICE.

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GAS AND AIR MIXING BURNER.

SPECIFICATION forming part of Letters Patent No. 697,768, dated April 15, 1902.

Application filed September 4, 1901. Serial No. 74,283. (No model.)

To all whom it may concern:

Be it known that I, WILLIS J. WOODWARD, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Gas and Air Mixing Burners; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in the construction of gas-burners of various types, whereby the gas or the gas mixture supplied to the burners may be mixed intimately with air at the point of ignition or where combustion takes place, the invention having particular reference to the draft-tubes of the burner and the parts of the burner with which the tubes connect and coact.

The objects of the invention are to provide a gas-burner for use in utilizing either artificial or natural gas that will be durable and economical in use, which particularly may be employed in severe service without liability of the burner becoming overheated, and thereby damaged, which will insure perfect combustion with varying gas-pressures, and which in cases of necessity may be quickly and cheaply repaired by unskilled operators, thereby avoiding the delays and expense incident to sending a burner to a workshop.

Another object is to provide a draft-tube that may be supported at only one end and be expansible at the other end thereof and also permit the top plate of the burner to expand and contract and move over the ends of the tubes without injury thereto, while at the same time providing gas-ducts close to the air-ducts in the tubes, still another object being to provide a draft-tube that may be easily removed and replaced.

My invention consists in a gas-burner comprising a gas-receptacle having improved draft tubes or ducts extending therethrough, provided with gas-ducts from the receptacle substantially to the draft-ducts at oblique converging angles thereto, or so that the gas or gas mixture escaping from the receptacle

through the gas-ducts shall be projected obliquely into the air passing either through or from the draft-ducts and become mixed with the draft-air before or at the moment combustion occurs.

The invention also consists in the novel parts embodied in the details of construction and in the combination and arrangement of parts, as hereinafter particularly described and claimed.

Referring to the drawings, Figure 1 illustrates the practical application of my invention as it may relate to a small steam-boiler and furnace adapted for automobiles, the view being of the boiler and the furnace in elevation, with portions in section, showing the relative position of the burner below the boiler; Fig. 2, a top plan view of the furnace and the burner; Fig. 3, a fragmentary plan view of the burner-top; Fig. 4, a view in elevation of a burner draft-tube having improvements in accordance with my invention, a part being in section, showing the interior of the tube; Fig. 5, a fragmentary vertical sectional view, as on a line A A, Fig. 3, showing parts of the gas-receptacle and the tube comprised in the burner; Fig. 6, a fragmentary plan view of the burner-top, showing the form of apertures in which the tubes illustrated in Figs. 4 and 6 are inserted; and Fig. 7, a top plan view of a draft-tube as illustrated in Fig. 4, with a portion of the upper end thereof broken away.

Similar reference characters in the several figures of the drawings designate corresponding parts.

In construction the burner-body may be formed in various patterns, my improvements being confined to the tubes and the parts immediately above which combustion occurs or, specifically, the parts from which the jets of gas and air mixture are projected for maintaining combustion. The furnace also may be of any suitable type, and in some cases the furnace may be a stove, while in some cases the burner may be used in an open fireplace without an inclosing furnace-wall.

For the purpose of illustrating the manner in which my invention may be advantageously employed I show it in connection with a small steam-boiler and furnace, combustion occurring below the lower ends of vertical boiler-tubes.

In the use of gas-burners for generating steam in motor-vehicles heretofore the gas mixture has been made in a pipe and conveyed into the gas-receptacle in the burner, from which it escaped to be consumed through small vertical orifices usually arranged in circles in the top of the burner about draft-tubes, but so far removed from the bore of the tubes that perfect mixture of gas and air could not be had and only partial mixing was possible when using the gas under pressure, and when the gas-generator would be stopped and the quantity of gas in the receptacle of the burner diminished the gas would burn down close to the burner-top and even in the receptacle, with the result that the burner-top would become overheated and warp or the flame would become extinguished, this often occurring at a critical time when it might be needed for raising more steam-pressure. To avoid the warping of the burner-top or in efforts to do so, the upper ends of the draft-tubes have been beaded over upon the top of the burner, thereby increasing the distance at which the gas-apertures must be placed from the bore of the draft-tube without remedying the prime evil, the lower ends of the tubes being suitably secured to the bottom of the burner-body. In the present invention, as will be seen, the objections above mentioned are avoided.

The furnace may have a shell *b* adapted to be attached to a boiler *a*, and the bottom *c* of the burner, composed of a metallic plate, may also be the bottom of the furnace, as shown. The remaining portions of the burner-body comprise a metallic top *d*, secured suitably by means of a side rim or flange to the bottom *c*, or it might be attached to the shell *b*, so that a chamber be formed for receiving the gas. It will be understood that the gas may be provided and conducted into the burner-receptacle in any suitable manner.

In practically carrying out my invention I preferably employ circular tubes *e*, providing draft-ducts for the furnace and boiler, the tubes being novel in form. The external diameter of each tube is uniform throughout, the lower end having a screw-thread *f*, formed by cutting a groove in the metal, and this lower end is inserted in a suitable hole having a corresponding screw-thread in the bottom *c*. The top *d* has circular holes *i*, through which the tube is inserted in connecting it with the bottom, (an expanding-wrench being employed in the operation.) In some cases, however, the tubes may be designed to be inserted from the bottom of the burner, in which case the lower ends of the tubes would have the thread projecting above the surface of the tube and the hole in the plate *c* would be larger accordingly to admit the tube-body. The upper portion of each tube has a plurality of gas ducts or passages *g*, provided by cutting or otherwise forming longitudinal grooves in the exterior surface of the tube close to the bore at the upper end *h* of the

tube and having the bottoms of the grooves in oblique-angled planes or curves converging at the axis of the bore of the tube. The body of the tube *e* should fit neatly into the hole *i* and extend approximately to the top of the plate or top *d* of the burner. When grooves are cut in the tubes, the bottoms of the grooves may be either straight or curved, and they are cut of such depth that the metal at the top *h* will be extremely thin. Thus the gas-ducts will be formed partly by the grooves and partly by the wall of the hole *i* in the top *d*, and the bottoms of the ducts being in convergent planes will permit the gas to flow directly into the path of the draft-air going through the tube and perfect smokeless combustion will result.

Heretofore in my practice the grooves have been cut in the tubes *e* by machinery; but the tubes may be cast with the grooves in them. I may also devise other means by which to cheaply produce the tubes, the prime object being to form the gas-ducts as closely as possible to the draft-ducts or to the air passing through them, partly in order to obtain under varying conditions the combustible elements in the air and partly to take advantage of the cooling effects of the air upon the tubes and the top *d* in order to prevent overheating and consequent warping of the top and loosening of the tubes in the top apertures, evils which heretofore have been the inevitable results with other burners of burning gas that escaped from mere orifices in the burner-tops more or less remote from the draft-ducts, another result of such construction in other burners being incomplete combustion, particularly when the supply of gas becomes diminished and the flames are close to or in the orifices, not the least objection to which is the odors thrown off from gasolene-gas, as will be understood.

In practical operation the gas or the gas mixture to be used as fuel is to be conveyed by a suitable duct into the gas-receptacle in the burner-body, so as to surround the draft-duct tubes therein. The gas will then escape from the receptacle through the gas-ducts into the path of the draft-air and become mixed with the air, and if then ignited the fuel mixture will burn with a blue smokeless flame visible somewhat above the orifices of the gas and the draft ducts, the maximum degree of heat being obtained under these conditions, and there being no flame in immediate proximity to the burner parts damage thereto will be avoided. When it may be desired to reduce the intensity of the fire, the supply of gas is to be reduced, when, obviously, the jets of flame will diminish in size and gradually shorten and approach the burner-orifices until, as the gas may become nearly exhausted, the jets will burn low at the orifices, the gas still taking up air from the draft-ducts and being perfectly consumed, while the parts are cooled by the currents, which will not become greatly heated with the feeble flames.

Usually a very small supply of gas may be continued, which will still be consumed at a few of the burner-orifices, so that when it is again desired to increase the heat it will only
5 be necessary to increase the gas-supply, which will ignite from the burning jets without the annoyance of reigniting by other means. In the use of these burners the orifices will not require cleaning, as there will be no deposits
10 of crust in the orifices, as is the case in other burners heretofore employed where the combustion is imperfect.

Having thus described my invention, what I claim as new is—

15 1. A gas and air mixing burner comprising draft-tubes having each an external screw-thread at the lower end thereof and also having at the opposite or upper end thereof ducts formed with the bottoms thereof extending
20 inwardly and upwardly from the outer surface of the tube to the edge of the top adjacent to the bore thereof, a bottom plate having threaded holes engaged by the threads on said tubes whereby the same are supported,
25 a top plate having perforations in which said tubes may rotate, and a wall connecting said plates.

2. In a gas and air mixing burner, the combination with the perforated top plate and
30 the perforated bottom plate, of the screw-threads in the perforations in said bottom plate, and the draft-tubes having the external

screw-threads engaging the screw-threads in said perforations and also having each the ducts formed with the bottoms thereof extend- 35 ing inwardly and upwardly from the outer surface of the tube to the edge of the top adjacent to the bore thereof, said ducts extending into the perforations in said top plate.

3. The herein-described burner-tube consisting of a hollow cylinder the upper end of which has the grooves formed with the bottoms thereof extending inwardly and upwardly from the outer surface of the tube to the edge of the top adjacent to the bore there- 45 of, and the lower end of which has the external screw-thread formed thereon.

4. In a gas and air mixing burner, the combination of the bottom plate having the apertures therein, the screw-threads in said aper- 50 tures, the top plate having the apertures therein, the draft-tubes having the screw-threads engaging and supported by the screw-threads in said apertures and having the upper ends thereof movably inserted in the ap- 55 ertures in said top plate, and the air-ducts and the gas-ducts in said tubes, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIS J. WOODWARD.

Witnesses:

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