

May 28, 1935.

B. Q. P. FOSS

2,002,660

BURNER

Original Filed Jan. 3, 1922 2 Sheets-Sheet 1

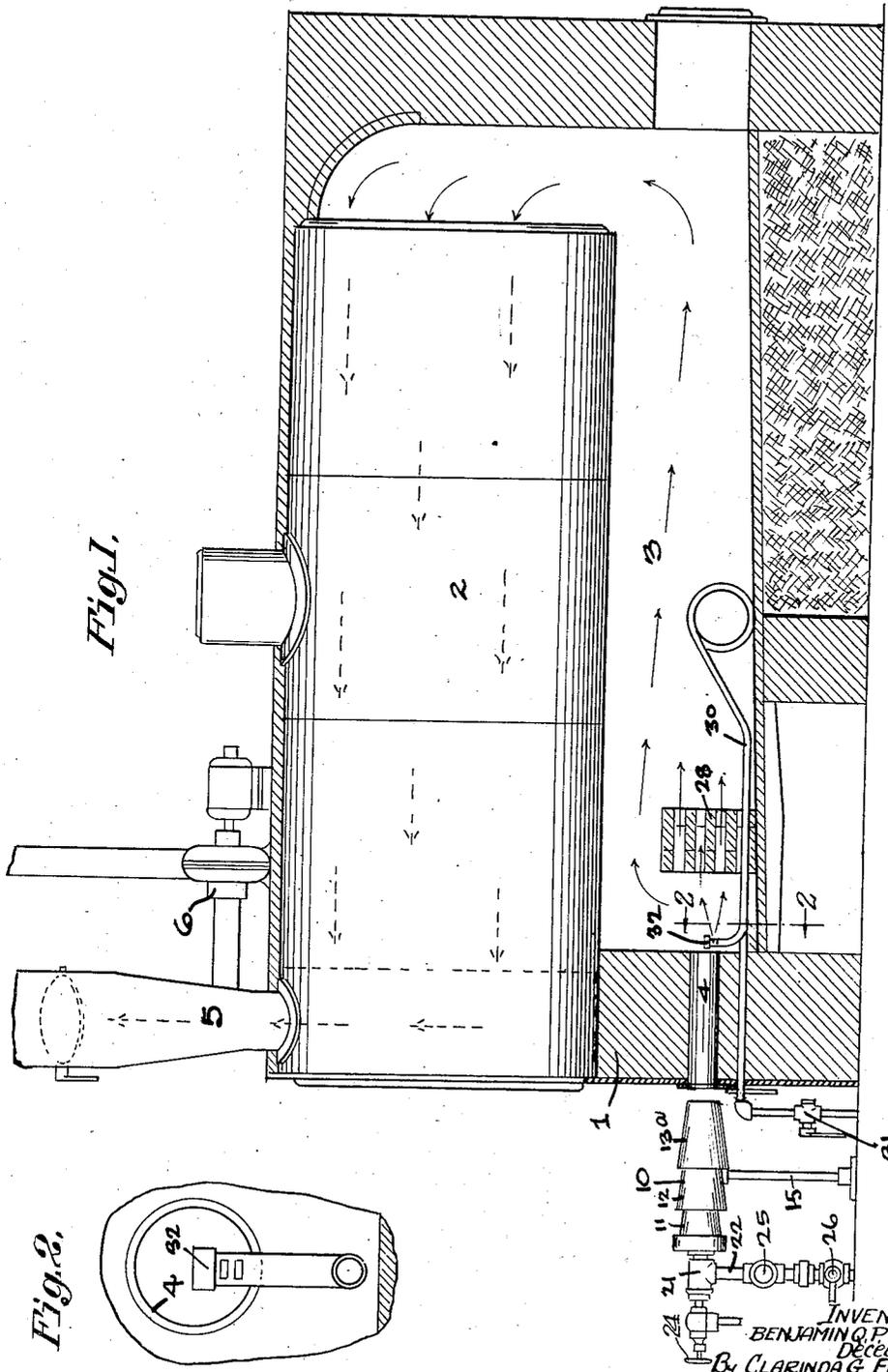


Fig. 1.

Fig. 2.

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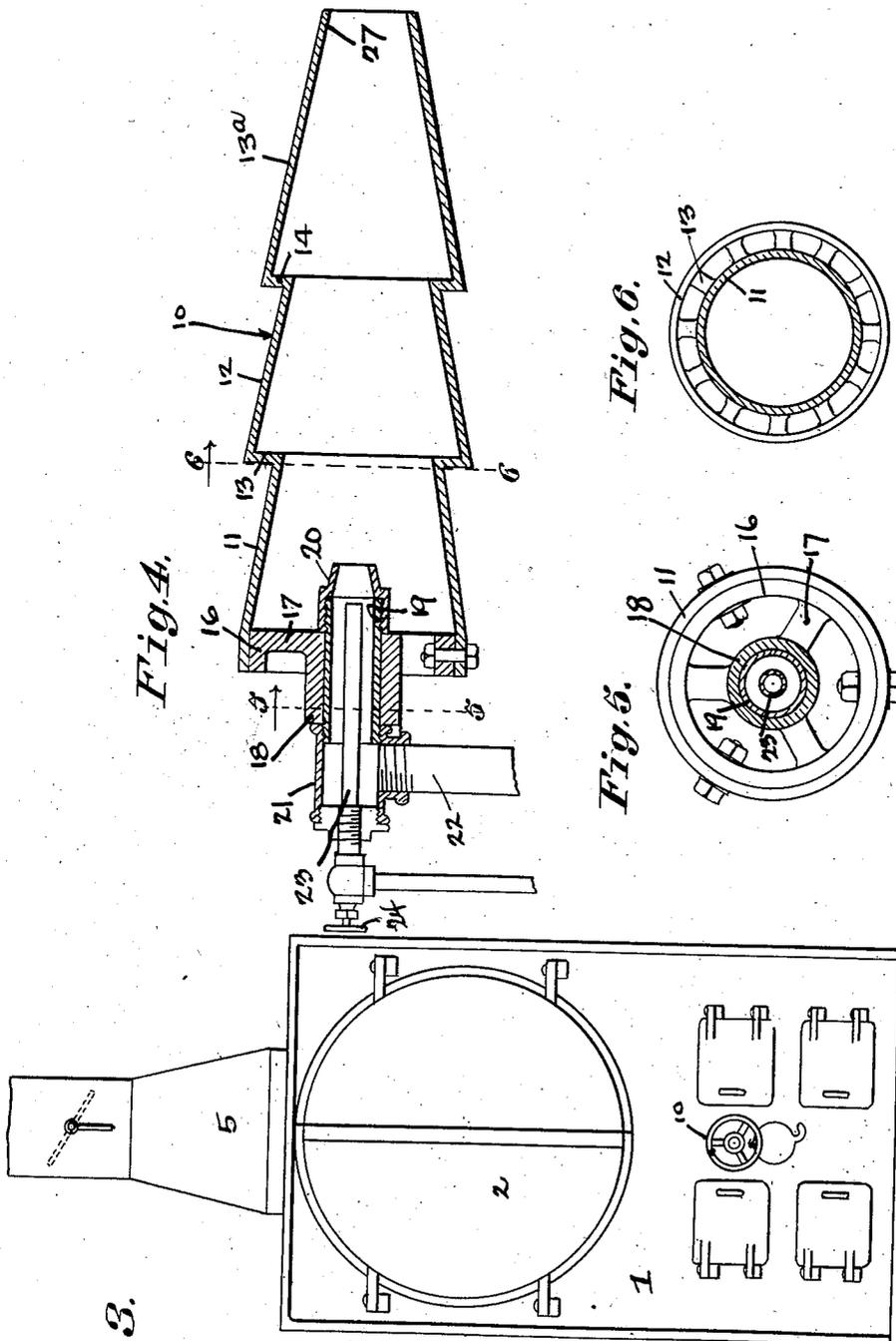


Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE

2,002,660

BURNER

Benjamin Q. P. Foss, deceased, late of San Francisco, Calif., by Clarinda G. Foss, executrix, San Francisco, Calif.; said Benjamin Q. P. Foss assignor of sixty per cent to Lester McDonald, Bakersfield, Calif.

Refiled for abandoned application Serial No. 526,540, January 3, 1922. This application September 5, 1930, Serial No. 479,986

2 Claims. (Cl. 158—7)

This application is a refiled application for abandoned application filed Jan. 3, 1922, Serial No. 526,540, and it is hereby declared the following is a full, clear, concise and exact description of the same.

This invention relates particularly to a gas burner.

An object of the invention is to provide a gas burner so constructed and arranged that the volume and velocity of gas passing through the burner automatically controls and determines the requisite volume and quantity of primary air to be mixed therewith for the purpose of combustion.

A further object of this invention is to provide a burner adapted to burn either artificial or natural gas separately or in combination or intermixed with air, with perfect combustion and utilizing all of the heat units therein contained.

A still further object of the invention is to provide a furnace having a gas burner therein, in combination with an auxiliary conduit for introducing water or steam, within said furnace, whereby the heat from the burner, will produce a temperature at which water begins to decompose and dissociate in the auxiliary conduit to produce as a result, superheated steam, hydrogen and oxygen gases which may be effectively burned in combination with the gas issuing from the burner. A further object of this invention is to provide a gas burner that will be superior in point of simplicity, and inexpensive in operation facility and convenience in use and general efficiency.

Other objects and advantages will appear as this description progresses.

In this specification and the annexed drawings, the invention is illustrated in the form considered to be the best, but it is to be understood that the invention is not limited to such form, because it may be embodied in other forms; and it is also to be understood that in and by the claims following the description, it is desired to cover the invention in whatsoever form it may be embodied.

In the accompanying two sheets of drawings:—

Fig. 1 represents a vertical section through a furnace having a burner constructed in accordance with the invention applied thereto.

Fig. 2 represents an enlarged detail taken through Fig. 1 on the line 2—2.

Fig. 3 represents a front elevation of Fig. 1.

Fig. 4 is an enlarged sectional view taken through the burner constructed in accordance with the invention.

Fig. 5 is a section taken through Fig. 4 on the line 5—5.

Fig. 6 is a section taken through Fig. 4 on the line 6—6.

In detail the construction illustrated in the drawings comprises a boiler and mounting or other equivalent furnace, such for instance as annealing furnaces, house furnaces, ranges and the like generally designated by the numeral 1.

In Fig. 1 the boiler 2 of the type shown has longitudinal tubes therein and is mounted on a suitable foundation, providing a fire box 3 beneath the boiler. The said furnace is so arranged that a draft from the burner inlet 4 will pass through the fire box 3, the tubes of the boiler (as indicated by arrows) and either outwardly through the stack 5 or through a mechanical exhausting apparatus 6 to be used in lieu of the natural draft of the stack. Where the stack is efficiently constructed so as to maintain at all times an equalized fire, the blower would be dispensed with, but where it is possible the exhausting apparatus is installed for the reason that it maintains a more constant draft through the fire box and creates a better fire.

It is to be understood that the burner shown is one which has been constructed so as to entrain the required amount of air at various gas pressures to effect a great saving of fuel burned, as contrasted with other burners.

This burner is not limited to this particular furnace, as it is to be understood the burner can be applied equally well to any and all types of furnaces.

The burner, generally designated by the numeral 10, is mounted outside the furnace and preferably in axial alignment with the mixing conduit 4, which passes through the front wall of the furnace mounting and communicates with the fire box within the furnace. The burner 10 comprises a metal casting having a plurality of conical shaped chambers, substantially connecting one with the other, said chambers being suitably connected to adjacent chambers at contiguous ends. In Fig. 4, there is illustrated a metal casting having three chambers, 11, 12 and 13a, all of which are cone shaped. The smaller end of chamber 11 communicates with the larger end of the chamber 12, the metal casting between the chambers 11, and 12 is first drilled and then the holes are milled to elongate them to form a perforated webbing 13, the smaller end of chamber 12 communicates with the larger end of chamber 13a, the metal casting between the chambers 12 and 13a is first drilled and then the holes are

milled to elongate them to form a perforated webbing 14.

As will be obvious, the respective chambers 11, 12 and 13a are coaxially arranged relative to each other and the metal casting is adapted to be mounted on a support arm 15 so as to lie substantially on the same axis as the burner mixing conduit 4.

The enlarged end of chamber 11 is partially closed by the burner head 16, having a suitable hollow hub bearing 18, and radial arms 17 thereon, the hollow hub bearing 18 positioned coaxially with said chamber 11. The radial arms 17 connect the burner head 16 with the hollow hub bearing 18. A threaded nipple 19 is mounted within the hub 18 and has a nozzle 20 secured thereon within the chamber 11. The opposite end of the nipple 19 has a T-fitting 21 thereon.

Natural gas or artificial gas may be introduced through the conduit 22 into one of the appropriate openings in the T-fitting (after plugging up the other opening) from whence the said gas is distributed through the interior of the nipple 19, past the nozzle 20 into the interior of the respective chambers 11, 12 and 13a. In those instances where the gas pressure is insufficient to force itself from the chambers into the fire box, air under pressure may be appropriately introduced through T-fitting 21, from the conduit line 23 suitably controlled by the regulating valve 24. The auxiliary air pressure would also be necessary in instances where the furnace is operated under forced draft. The gas conduit line 22 is provided with a suitable regulating valve 25 thereon for regulating and controlling the quantity of gas passing into the furnace and with the cut-off valve 26 for cutting off the source of gas supply from the burner.

Years of research and experiments have determined that natural or artificial gas may be passed through a burner casting, arranged to have a plurality of chambers such as I have described, under as low a pressure as one inch water pressure on the gas. As the control valve 25 is regulated to discharge gas from the nozzle 20 into the chamber 11, the natural tendency of the gas is to pass through the chambers of the burner casting 10, and burner mixing conduit 4 into the fire box of the furnace due to the kinetic energy of the gas stream, and the draft created either by the stack or by the mechanical exhauster 6. As gas issues from the nozzle 20, primary air is entrained through the burner head 16 into the interior of chamber 11. As the gas and air continues through the respective chambers 12 and 13a additional primary air is entrained through the perforated webbings 13 and 14, due to the kinetic energy of the moving gas air mixture, and the draft created by the stack. The burner casting 10 is designed so that the first chamber 11 is the largest, the second chamber 12 is somewhat smaller, and the third chamber 13a is the smallest, this construction being for the purpose of increasing the velocity of the gas air mixture, as it passes through the burner casting 10, which in turn automatically regulates and controls the quantity of primary air entrained, in direct proportion to the volume and velocity of gas admitted through the nozzle 20.

As the gas passes through the nozzle 20 into the first chamber 11 of the burner casting 10, it draws primary air through the openings in the burner head 16, and as the gas air mixture leaves the first chamber 11 it passes the constricted opening, where the velocity of the gas air mixture is in-

creased as it enters the smaller second chamber 12, due to the kinetic energy of the gas air mixture and furnace draft, thereby causing an entrainment of primary air at the ported webbing 13, as the gas air mixture leaves chamber 12 it passes the constricted orifice as it enters the smallest third chamber 13a, where the velocity of the gas air mixture is increased, due to the kinetic energy of gas air mixture passing the constricted orifice, and by the furnace draft, thereby causing another entrainment of primary air at the ported webbing 14, as the gas air mixture leaves the constricted orifice 27 of chamber 13a, the velocity is again increased, due to the kinetic energy of the gas air mixture and the furnace draft, at this point the gas air mixture passes a space or gap between the burner casting 10 and the burner mixing conduit 4 in the fire wall which communicates with the fire box 3. As the gas air mixture passes the aforementioned space or gap adjacent the burner mixing conduit 4, it entrains more primary air as it enters the burner mixing conduit 4.

As the gas air mixture leaves the mixing conduit and enters the fire box 3 thoroughly intermixed, and due to the furnace draft under a velocity which causes the gas air mixture when lighted as a flame to blast against a breaking wall 28, set a predetermined distance from the end of the burner mixing conduit 4.

The fire that results is in the form of a mild blast which makes a purple flame of intense heat under a low gas pressure of from two ounces up. Although but three chambers are shown in the burner casting, this invention is not limited thereto inasmuch as it will clearly be within the scope to utilize a greater or lesser number, but the arrangement as shown providing four openings, wherein air will mix with the gas, has been found to be the proper number. If the mixtures are further accelerated it causes a lean mixture so that the fire produced does not have the heat effect that it does with the four mixtures aforementioned.

Where a lesser number of mixtures are used the volume of gas that may be burned is controlled by the predetermined quantity of air that can be burned with a gas of a certain B. t. u. test.

In a burner constructed in accordance with the invention, the volume and velocity of the gas passing through the chambers of the burner casting, and burner mixing conduit, together with the thermal convection induced by the products of combustion through the furnace flues and stack draft, automatically regulates and controls the entrainment of primary air necessary to complete combustion. Should the velocity and volume of gas entering the burner be cut down, the quantity of primary air entrained would automatically decrease in proportion, the burner is so constructed that the momentum of the gas jet bears a constant ratio to the momentum of the primary air mixture.

In the use of artificial or natural gas, a fuel of intense heat results, wherein the temperatures range from 2,000 to 2,500 degrees Fahrenheit. This heat is utilized secondarily by installing a hollow conduit, in the shape of a coil of pipe, within the fire box of the furnace and which is subjected to the heat of the flame issuing from the burner. Water or steam would be passed into the said conduit (from an external source controlled by the valve 31) and subjected to the heat ranging from 2,000 to 2,500 degrees Fahrenheit, a temperature at which water begins to dissoci-

ate in the said conduit into superheated steam, hydrogen and oxygen gases. The gases thus formed, would pass from the nozzle 32 of said conduit, at a point directly in the path of the flame issuing from the burner mixing conduit 4 as the superheated steam and gases blast against the blasting wall in the presence of the artificial or natural gas issuing from the mixing conduit hydrogen and carbon monoxide gases are formed, these gases burn with the artificial or natural gas to make a more intense heat than could be produced by the gas alone or gas in combination with air. In the operation of a furnace and burner constructed in accordance with the invention, it is desirable that the furnace be as hermetically sealed as possible except the mixing conduit whereby the air for combustion is mixed with the incoming gas as primary air, passing into the fire box through the mixing conduit 4.

It is to be understood that the invention is not limited to the combination of the gases used by this furnace, or to the appliances that are used in creating an augmented fire by the use of a hydrogen gas accompanied by its component part of oxygen, as many changes and improvements

would suggest themselves to those skilled in the art.

Having described the invention, what it is desired to secure by Letters Patent is:—

1. In a gas burning apparatus a mixing conduit, a burner comprising a casting, having a series of conical chambers therein having discharge ends of progressively smaller diameter, a burner head fitted to the inlet end of the foremost chamber having air admission openings, a gas supply conduit centrally connected to said head, a perforated web arranged between adjacent conical chambers, the constricted burner orifice of the final conical chamber of the series being arranged in axial alignment with the mixing conduit, there being a space or gap between the burner orifice and said conduit.

2. In combination with a device as set forth in claim 1, a steam generator arranged in the path of the flame issuing from the conduit, a vapor nozzle connected to the generator, and arranged in front of the conduit, said generator being heated by said flame.

CLARINDA G. FOSS, (Widow),
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