

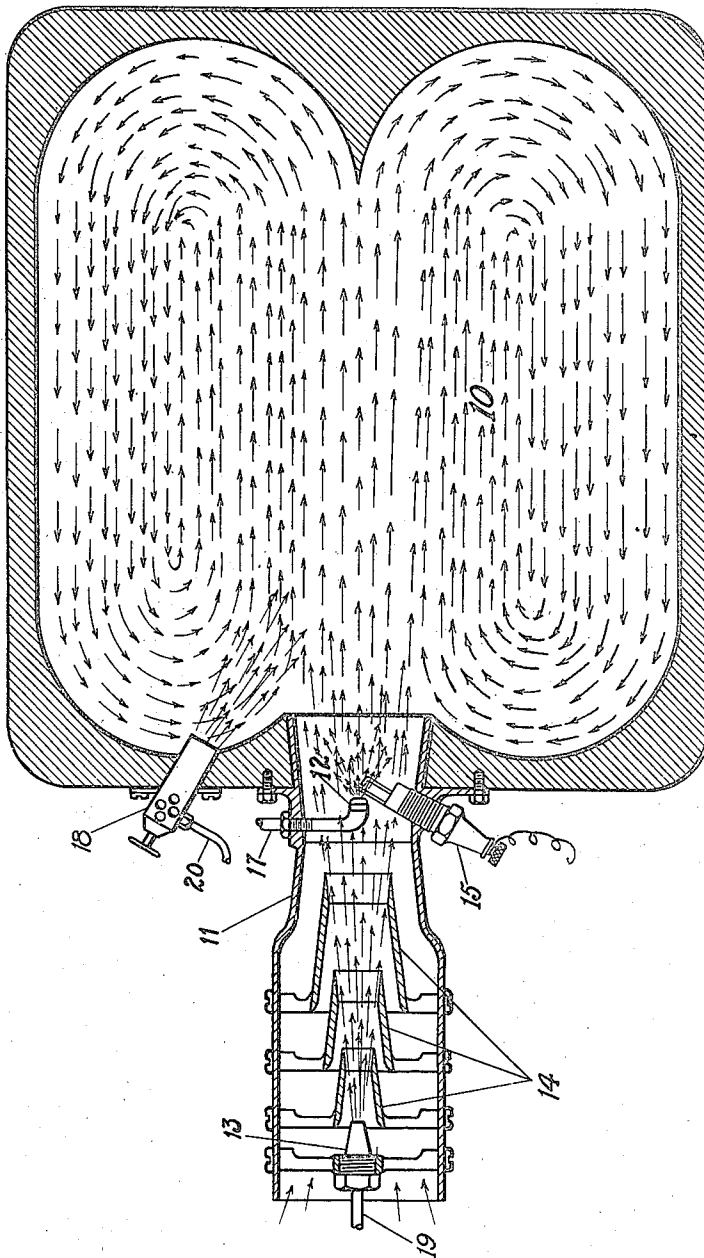
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HYDROCARBON BURNER

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UNITED STATES PATENT OFFICE.

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HYDROCARBON BURNER.

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To all whom it may concern:

Be it known that I, EARL C. WALKER, a citizen of the United States, residing at Canton, in the county of Fulton and State of Illinois, have invented new and useful Hydrocarbon Burners, of which the following is a specification.

This invention relates to hydro-carbon burners of the atomizing type.

10 A primary object of the invention is to provide a burner which does not have the characteristic roaring noise common to burners of this type.

Another object is to provide a burner in which the combustion is more complete and efficient, resulting in elimination of smoke and odor.

Another object is the provision in burners of this kind, of means for producing a more uniform distribution of heat so as to prevent unequal heating of different parts of the combustion chamber, thereby greatly adding to the life of materials composing the combustion chamber as well as the boiler or other parts associated therewith.

25 These and other objects are accomplished by my invention which is fully described in the following specification and shown in the drawing in which the figure is a longitudinal section thru the burner and combustion chamber.

30 I have illustrated an embodiment of my invention as applied to a combustion chamber 10 which is substantially rectangular in form, with inner walls having such contour as to give proper direction or circulation of the flame as indicated by the arrow points. A burner mixing tube 11, preferably of venturi shape, connects with and opens into the combustion chamber 10, while its opposite end communicates with the atmosphere. Within the mixing tube 11, and relatively close to the end of same in communication with the combustion chamber, is positioned a fuel spray nozzle 12, supplied with fuel under pressure through the pipe 17, leading from the source of fuel supply (not shown), while back of the fuel spray nozzle 12 and relatively near the mouth or inlet of the mixing tube is located the induction nozzle 13, supplied with compressed air or steam under pressure through the pipe 19. Both the fuel spray nozzle 12 and the steam or compressed air nozzle 13 are placed substantially concentric with the

mixing tube 11 and set so that both discharge their respective issuing jets toward and into the combustion chamber 10. The object of the nozzle 13 is to induce the air supply for combustion to flow through the mixing tube 11, into the combustion chamber 10. To increase the efficiency of the induction jet issuing from the nozzle 13, a series of frusto-conical tubes 14, are placed concentric with the mixing tube 11 and are located in front of the induction nozzle 13, so that its issuing jet will flow there-thru.

Extending into the mixing tube 11 is an electric spark plug 15, so placed that the electric spark produced by it will take place within the zone of the diverging spray of fuel from the atomizing or spray nozzle 12, to insure prompt ignition. Connected with the atomizing fuel nozzle 12, is the pipe 17 for conveying fuel under pressure from a fuel tank, or other source of supply. The fuel nozzle 12 may be of any approved design, but preferably such that the fuel is as finely atomized as possible. At 18 is shown a pilot light or sub-burner which may be of the form of an ordinary blow torch burner, and supplied with fuel thru the pipe 20. The pilot light 18 is placed so that it will project its flame within the combustion chamber 10 and preferably in close proximity to the incoming charge of air and fuel as it enters from the mixing tube 11, the object being to facilitate early ignition. It will be understood that either the spark plug 15 or the pilot light 18 may be used as a means to ignite the atomized fuel, or both may be used; the chief object of the pilot light 18, aside from its function as a means of igniting the main burner, being to maintain steam in the boiler with which the burner is used, when the main burner for any reason is not in operation. The operation of the burner is as follows:—

From a source of supply (not shown) fuel under pressure is turned through the pipe 17, leading to the nozzle 12, from which it issues in an atomized state and is ignited by an electric spark produced by the spark plug 15, or by the flame of the pilot light 18. Immediately following or simultaneously with the turning on of the fuel to the spray nozzle 12, steam or compressed air under suitable pressure is turned into the pipe 19, connected to the induction nozzle 13 from which the jet of steam or compressed air

issuing with considerable velocity and flowing through the frusto-conical tubes 14 and the Venturi mixing tube 11, induces air to flow through the mixing tube 11 into the combustion chamber 10. This induced air, as it passes the fuel spray nozzle 12, partially mixes with the spray issuing therefrom, and carries it into the combustion chamber 10, which is preferably of such shape that the velocity of the incoming mixture of air and fuel will cause the resulting flame to take a rotary or whirling motion so that the combustion will be completed within the combustion chamber, thus preventing the flame from rising and impinging on the surfaces of the boiler which is preferably located above the combustion chamber or fire box 10.

It will be noted that the inducted air has attained considerable velocity before it reaches the spray from the nozzle 12, which is located near the outlet of the mixing tube 11, where it enters the combustion chamber 10. The air and fuel are not thoroughly mixed until the charge has entered the combustion chamber. The atomized spray from the fuel nozzle 12 spreads in the form of a cone and the air being forced past envelopes this spray and results in a relatively lean mixture adjacent the walls of the mixing tube 11, where it enters the combustion chamber while the central portion of this conical spray remains comparatively rich until it has entered the combustion chamber. This condition prevents any tendency of the charge to "back fire" into the mixing tube 11 and hence eliminates the roaring noise characteristic of burners of the atomizing type as commonly constructed. It also facilitates ignition by means of an electric spark.

It is understood that the relative amount of fuel and air in the mixture required for perfect combustion may be regulated by suitable valves (not shown) located in the supply pipes 17 and 19. It is also clear that any desirable method of producing and timing the electric ignition spark may be employed.

An important feature of my invention is the mixing of the charge of fuel and air which is not completed until it has entered the combustion chamber. This not only results in the elimination of the objectionable roaring noise as previously explained, but what is of even greater importance, is the fact that a softer flame results due to the longer time required to burn the mixture and instead of this flame impinging with concentrated intensity against the wall of the combustion chamber and intensifying the heat at this point, the combustion of the charge of the flame propagation is gradual, taking place as the charge rotates or whirls in the combustion chamber. The result of this is better and more even heat distribution and

hence it contributes not only to boiler efficiency but also to boiler longevity. A common objection to ordinary forms of liquid fuel burners of the atomizing type, as previously constructed, has been the damage to boilers resulting from the concentration of the heat at one zone of the combustion chamber.

It will be seen from the illustration and description that either compressed air or steam may be used in connection with the induction nozzle 13 for inducing the air supply necessary for combustion. It will be also understood that compressed air may be used for the initial operation of the burner until steam pressure on the boiler is generated, when this steam pressure may be used instead of the compressed air.

While the burner is here illustrated in combination with a combustion chamber of substantially rectangular form with inner walls of such contour as to cause the incoming charge of air and fuel to divide and rotate in two adjoining vortices, for the purpose of preventing the fire from rising out of the combustion chamber and to cause complete combustion by thoroughly mixing the incoming charge, the burner may be used with other forms of combustion chambers.

While I have shown and described but a single embodiment of my invention, it is to be understood that it is capable of many modifications. Changes therefore in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims, in which it is my intention to claim all novelty inherent in my invention as broadly as possible in view of the prior art.

What I claim as new and desire to secure by Letters Patent is:—

1. A hydrocarbon burner comprising an air induction tube, an induction nozzle stationed relatively near the air inlet of said induction tube, a fuel spray nozzle located within said induction tube ahead of said induction nozzle and in the path of the issuing jet from said induction nozzle and the air supply induced thereby, both nozzles being located substantially concentric with the throat of the induction tube.

2. In combination, a combustion chamber having an inlet opening and an outlet opening, a hydrocarbon burner in said inlet opening, comprising an induction tube, a nozzle adapted to deliver an air inducing jet of gas under pressure and located at the entering end of said induction tube, a fuel spray nozzle located at the delivery end of the induction tube, adjacent the combustion chamber, and in the path of the induced air so that the mixture of fuel and air passes directly into the combustion chamber.

3. In combination, a combustion chamber,

- a hydrocarbon burner comprising an air induction tube, an opening in said tube communicating with the atmosphere, a nozzle adapted to deliver an air inducing jet of gas under pressure and located at one end of said induction tube, and a fuel spray nozzle located at the other end of the induction tube and in the path of the induced air supply, said burner being so placed with relation to the combustion chamber as to produce a vortex therein,
4. In combination, a combustion chamber, a hydrocarbon burner comprising an air induction tube, an opening in said tube communicating with the atmosphere, a nozzle adapted to deliver an air inducing jet of gas under pressure and located at the entering end of said induction tube, and a fuel spray nozzle located at the delivery end of the induction tube and in the path of the induced air supply, said combustion chamber having an internally projecting wall, the mixture from said burner being directed against said projecting wall so as to form two vortices substantially filling the combustion chamber.
5. A hydrocarbon burner comprising an air induction tube, a series of frusto-conical tubes located therein, and substantially concentric with said induction tube, a nozzle adapted to deliver an air inducing jet of gas under pressure through said frusto-conical tubes and said induction tube, a fuel spray nozzle located within said induction tube and ahead of said frusto-conical tubes and in the path of the issuing jet from said induction nozzle and an ignition spark plug in front of said fuel spray nozzle.

EARL C. WALKER.