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GAS BURNER

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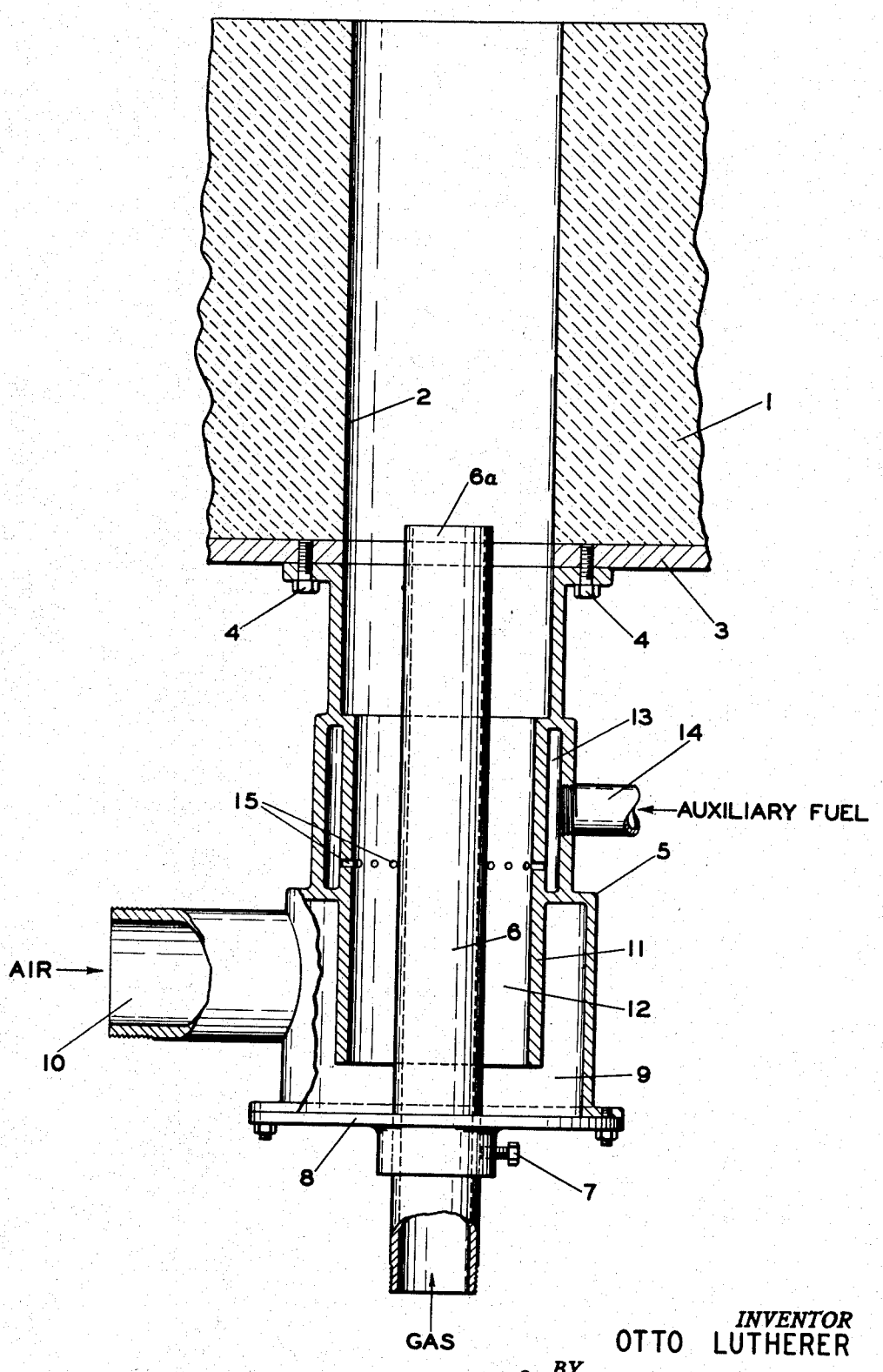

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GAS BURNER

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5 Claims. (Cl. 158—110)

This invention relates to burners for gaseous fuels wherein combustion is characterized by a luminous flame.

The combustible constituents typically employed in such a burner are usually the available natural or artificial gas hereinafter referred to as gas or merely fuel, and a suitable supporter of combustion therefor, usually air, and hereinafter so referred to; although it will be appreciated that other gaseous hydrocarbon fuel and suitable supporter of combustion therefor may be employed.

In some industrial burner applications it has recently been considered desirable that the flame have a luminous characteristic, by which some of its heat may be distributed to the work by radiation. Heretofore in the art it has been considered necessary to this end, that very close regulation be maintained, of relative velocities of the combustible constituents and of the rate and manner of their commingling, it being considered essential that combustion be at a slow rate, confined to a limited zone of contact between adjacent confluent streams of gas and air.

Objects of this invention are to produce means by which luminous combustion may be had without critical sensitivity of such operating conditions.

Luminous combustion is obtained according to this invention, by cracking or breaking down of the gas by heat, without combustion, to liberate minute particles of free carbon, which subsequently, during combustion, become incandescent; the invention being based upon the theory that heat only is required to crack the gas, so that its subsequent incandescence is not primarily a function of time or of its manner of joining the air of combustion, and hence the invention does not contemplate the usual attempt to prevent or delay or particularly control intermingling of the air with the gas, the latter having been cracked.

More particular objects of the invention are therefore to provide for the liberation of free carbon particles within the burner itself and in amount easily controlled by control of the amount the gas is preheated. The burner contemplated by the invention includes means for so preheating the gas, by auxiliary combustion, independent of the primary combustion accomplished by the burner, the auxiliary combustion being either of an independent fuel or of a portion of the gas with which the burner is supplied.

The exact nature of this invention together with further objects and advantages thereof will be apparent from the following description taken in connection with the accompanying drawing which is, generally, a typical longitudinal section through a characteristic embodiment thereof.

With reference now to the drawing, 1 represents the wall of an industrial furnace, having a burner inlet opening 2, and the usual cover plate or jacket 3.

Secured to the outer end of the opening 2 as by the bolts 4, is a burner generally indicated at 5. The burner includes a central tubular duct or pipe 6, the outer end of which is adapted for connection with a gas supply as indicated. The duct is preferably longitudinally adjustable relative to other parts of the burner and, as shown for the purpose, is secured in slidably adjusted positions by a set screw 7 in the closure 8 in which the duct bears. The burner includes a casing providing cavity 9 about the duct 6 having the lateral connection 10 for a source of air supply. A baffle 11 extending into the cavity 9 about the duct 6 in the zone of the connection 10 forms an annular passage 12 about the duct and provides a uniform air flow along the passage 12 from the air inlet. About the passage 12 is the jacket indicated providing an annular chamber 13 having connection as at 14 for a source of auxiliary fuel; and a number of circumferentially spaced openings 15 allow flow of fuel from the chamber 13 to the passage 12 and about the duct 6.

It will be appreciated that all the burner parts described, with the exception of the supply connections referred to, may be of circular section and coaxially arranged as indicated; and that the opening 2 in the furnace wall is formed as indicated, to provide a continuation of the discharge opening of the burner; but other sectional forms of the parts may be preferable in specific applications.

In operation of the burner air is supplied through the connection 10, the fuel gas through the duct 6 and an auxiliary gaseous fuel through the connection 14, all as indicated by the legends on the drawing, each under sufficient pressure to accomplish its feeding, and preferably each under suitable volumetric control as by the usual valve means.

The air entering the chamber 9 is evenly distributed by the baffle 11 so that it flows through the passage 12 as a stream of annular section along and about the duct 6, thence through the furnace wall opening 2, and ultimately into the furnace.

The auxiliary fuel is distributed by the annular chamber 13 and finds its way into the passage 12 through the openings 15, forming a ring of

jets about the duct 6. Combustion of this auxiliary fuel at these jets heats the duct 6 to a high temperature, controlled by the amount of auxiliary fuel fed to the jets. The amount of air flowing through the passage 12 is very much in excess of that necessary to support complete combustion of the auxiliary fuel at the jets. In fact it may in some cases be desirable that a certain amount of air be included with the auxiliary fuel supplied to its inlet connection 14. At any rate, there issues from the passage 12 into the opening 2, sufficient air to support complete combustion of gas discharged by the mouth 6a of the duct, including however the products of combustion of the jets at the openings 15.

The gas flowing through the duct 6 is cracked or broken down by the temperature to which the duct is raised by the auxiliary fuel jets, so that the gas leaving the mouth 6a of the duct, acting as a nozzle, includes, entrained, the minute carbon particles liberated by the cracking process. As the gas leaves the duct and mingles with the air its combustion takes place, the combustion of the entrained carbon particles being accompanied by their incandescence so that the flame has a luminous character.

While this luminous combustion might theoretically commence close to the end 6a of the gas duct, it will be relatively slow, continuing through the opening 2 in the furnace wall and therebeyond, most of the flame extending into the interior of the furnace, as will be appreciated by one familiar with the art, and the hollow of the opening 2 acting primarily as a mixing chamber. By longitudinal adjustment of the nozzle or gas duct 6 its mouth 6a may be so positioned that the flame will be substantially wholly within the furnace cavity.

By the arrangement described, the greater the amount of heat supplied by the auxiliary fuel, which heat is easily controlled by control of the auxiliary fuel itself, the higher will be the temperature to which the gas in the duct 6 will be heated and the greater will be the degree of its cracking. Thus the degree of carbon liberation can be controlled independent of the furnace temperature.

Also, the proper functioning of the burner is substantially independent of gas and air velocities through the burner and of the rate of mixing of the gas and air after they have passed from the burner into the furnace.

What I claim is:

1. In a gas burner of the class described, pipe means arranged to deliver fuel at one end, casing means arranged to provide a chamber about said pipe means, with an end opening in the direction of flow in the pipe means and with its opposite end closed, said casing having a lateral air inlet adjacent its closed end, annular baffle means arranged opposite said inlet, with an end opening in the direction of the closed casing end but short of the latter, said pipe means being mounted upon said casing end, and means including an opening in said casing means for feeding auxiliary fuel to said chamber about said pipe means.

2. In a gas burner of the class described, a straight pipe arranged to deliver gas at one end, casing means arranged to provide a chamber coaxially disposed about said pipe, with an end opening in the direction of flow in the pipe and with its opposite end closed, means for feeding auxiliary fuel to said chamber distributed about said pipe, and means for feeding air to said chamber adjacent the closed end of the latter, in sufficient amount to support combustion of both of said fuels, and baffle means arranged coaxially within said chamber to distribute said air uniformly about said pipe before contact of said air with either of said fuels.

3. In a gas burner of the class described, a straight pipe arranged to deliver gas at one end, casing means arranged to provide a coaxial chamber about said pipe, with an open end adjacent the mouth of said pipe and with its opposite end closed, means for feeding auxiliary fuel to said chamber intermediate the ends thereof and distributed about said pipe, said casing means having a lateral air inlet adjacent its closed end and baffle means coaxially arranged opposite said inlet to provide distribution of air about said pipe before contact with said auxiliary fuel.

4. In a gas burner of the class described, a straight pipe arranged to deliver gas at one end, casing means arranged to provide a coaxial chamber about said pipe, with an end opening in the direction of flow in the pipe and with its opposite end closed, said casing having a lateral air inlet adjacent its closed end, baffle means arranged opposite said inlet to direct inflowing air toward the closed end of said chamber, thence toward the mouth of said pipe, and means for feeding auxiliary fuel to said chamber about said pipe, between said pipe mouth and said baffle means.

5. A gas burner of the class described comprising a straight main fuel pipe having an open mouth, casing means arranged to provide a chamber coaxial with said pipe, with an end opening in the direction of flow in the pipe and with its opposite end closed about the pipe, said pipe extending into said chamber, said casing means having a lateral air inlet opening and baffle means arranged to direct incoming air toward said closed chamber end and about said pipe, and means for feeding auxiliary fuel about said pipe within said chamber.

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