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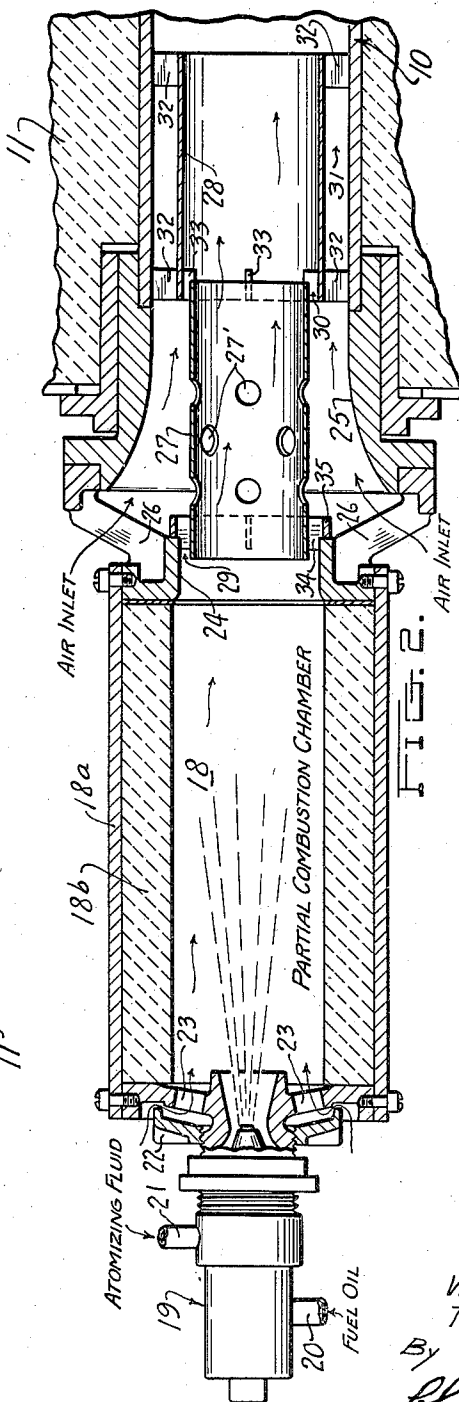
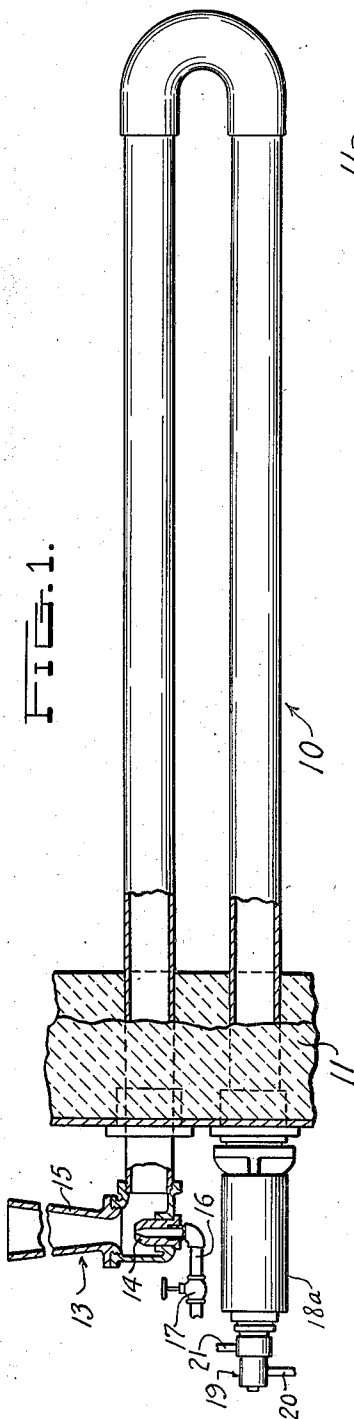
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HEATING APPARATUS

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FIG. 1.



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HEATING APPARATUS

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6 Claims. (Cl. 126—91)

This invention relates to fuel fired radiator tubes for producing heat in furnace chambers and the like. The use of non-gaseous fuels for firing such tubes presents special problems that are not encountered when gaseous fuels are used and it is the object of the invention to provide for the successful utilization of initially non-gaseous fuels and more particularly fuel oil for firing such tubes.

Briefly stated the procedure in accordance with the present invention is as follows: gasifying the fuel by partial combustion in a chamber in close proximity to the intake end of the tube; conducting the highly heated gases to a point well within the intake end of the tube; supplying a relatively small quantity of air to the gases at one or more points intermediate the ends of the conductor whereby to insure that the gases shall be burning as they leave the conductor; enveloping the gases where they leave the conductor with the necessary amount of air to support complete combustion, and inducing said air to flow into the tube by draft producing means at the outlet end of the tube.

The preferred form of apparatus is shown in the accompanying drawing wherein,—

Fig. 1 shows a portion of a heating chamber wall, a radiator tube of hair-pin type extending through said wall, a cross section of the draft producing means associated with the outlet end of the tube, and a side elevation of the firing means associated with the inlet end of the tube, parts of the tube being in section. Fig. 2 is an enlarged sectional view of the firing apparatus associated with the inlet end of the tube.

10 indicates a radiator tube of hair-pin type and 11 a heating chamber wall through which the ends of the tube extend. Associated with the outlet end of the tube 10 is a draft producing device generally indicated at 13 and which preferably comprises a discharge nozzle 14 set to discharge into an eductor tube 15 which forms in effect an extension of the outlet end of said tube. Fluid under pressure is supplied to the nozzle by a supply pipe 16 provided with a flow regulating valve 17.

18 indicates a tunnel type chamber formed by a cylindrical metal shell 18a having an inner refractory lining 18b. At one end of the chamber 18 is a device generally indicated at 19 for discharging non-gaseous fuel such as fuel oil in finely divided condition into the chamber 18 for partial combustion therein. 20 and 21 indicate supply pipes for delivering fuel oil and atomizing fluid respectively to said device 19. A shut-

ter 22 in front of air inlets 23 is manually adjustable to regulate the amount of air entering the chamber, it being understood that the amount of air admitted is just enough to effect partial combustion of the fuel in order to produce a combustible gaseous fuel.

The chamber 18 has a circular outlet 24 and the radiator tube has a flaring inlet 25 which is open to the atmosphere. The tunnel is supported in axial alinement with the tube inlet in any preferred way as by rigid arms 26 between the rims of the said outlet and inlet.

The gases generated in the combustion chamber 18 are conducted to a point well within the inlet end of the radiator tube by a conductor comprising two disconnected but axially alined tubular members 27 and 28. The member 27 is smaller than the member 28 and projects a short distance into the latter whereby to form a relatively short open-ended annular air passage 30 between their adjacent ends; and the member 28 is smaller than the radiator tube whereby to provide an open-ended annular air passage 31 between itself and the tube. The amount of air entering the passage 30 is just enough to insure that the gas shall be burning when it discharges from the sleeve member 28 whereas the amount of air which flows from the passage 31 is enough to support complete combustion of the gas.

The tubular member 27 is desirably so arranged with respect to the chamber outlet 24 as to form an open-ended annular passage 29 between the said outlet and said end. Ordinarily the flow of fuel into the chamber 18 will be so regulated that for any given setting of the draft producing means the pressure in the chamber will be only slightly in excess of the air pressure prevailing around the conduit 27.

The gas which issues from the passage 29 will, of course, burn around the conduit 27 and thereby give indication that there is a plenum of gas in the chamber 18. The opening provided by the passage 29 also materially helps in dampening puffing effects in the chamber 18, and perforations 27' in the conduit 27 also contribute to the same end.

The member 28 is spaced from the radiator tube 10 by any preferred means as by spacing fingers 32. Spacing fingers 33 may also be provided between the adjacent ends of said members. The inlet end of the member 27 is held concentric with the outlet 24 by any preferred means as by spacing fingers 34 carried by a ring 35 outside of the outlet at the discharge side thereof.

Since the air for supporting combustion of the

gases flowed into the tube 10 from the chamber 18 is drawn into the tube by draft producing means at the outlet end of the tube and the air is caused to surround the gas where it is delivered into the tube, it will be readily appreciated that intermixing of the air and gas proceeds relatively slowly with the result that combustion proceeds progressively. Localized or spot heating of the tube is, therefore, prevented and uniform heat distribution obtained. At a point intermediate the ends of the tube it is desirable to stir up and thereby accelerate combustion of the flowing gases. In the case of a hair-pin tube the bend between the legs of the tube will cause such stirring to take place as will be readily appreciated.

The use of means for producing a constant and regulable suction effect at the exhaust end of the radiator tube is essential to proper firing of the tube and permits a much greater volume of fuel to be burned than could be burned if natural draft were relied on to induce combustion supporting air to enter the tube.

What we claim is:

1. The combination with a radiator tube for producing heat in furnace chambers and the like, of means for utilizing initially non-gaseous fuel for firing said tube comprising: a chamber where-through said fuel is flowed for gasification by partial combustion, draft producing means at the outlet end of said tube for inducing air to enter the inlet end thereof, and a conduit for conducting the gases of said partial combustion to a point well within the inlet end of said tube, the inlet end of said tube and the walls of said conduit being so arranged for air flow whereby the interior of said tube beyond said conduit is openly exposed to the inflow of air independently of said conduit and chamber.

2. The combination with a radiator tube for producing heat in furnace chambers and the like, of means for utilizing initially non-gaseous fuel for firing said tube comprising: a chamber where-through said fuel is flowed for gasification by partial combustion, draft producing means at the outlet end of said tube for inducing air to enter the inlet end thereof, a conduit for conducting the gases of said partial combustion to a point well within the inlet end of the tube, and means for directing a portion of the induced air into said conduit at a point intermediate the ends thereof, the walls of said conduit and the inner walls of said tube being arranged so as to allow air to flow whereby the interior of said tube be-

yond said conduit is openly exposed to the inflow of air independently of said conduit and chamber.

3. The combination with a radiator tube for producing heat in furnace chambers and the like, of means for utilizing initially non-gaseous fuel for firing said tube comprising: a chamber where-through said fuel is flowed for gasification by partial combustion, draft producing means at the outlet end of said tube for inducing air to enter the inlet end thereof, said inlet end being openly exposed to the admission of air from the atmosphere, a conduit for conducting the gases of said partial combustion to a point well within the inlet end of said tube, said conduit being exteriorly exposed to the induced air and comprising two partially telescoped tubular members of different diameters whereby to form an annular space between themselves for the admission of some of said induced air, and the smaller of said members leading from said chamber.

4. The combination with a radiator tube for producing heat in furnace chambers and the like, of means for utilizing initially non-gaseous fuel for firing said tube comprising: a chamber where-through said fuel is flowed for gasification by partial combustion, draft producing means at the outlet end of said tube for inducing air to enter the inlet end thereof, a conduit for conducting the gases of said partial combustion to a point well within the inlet end of the tube, and means comprising an annular passage intermediate the ends of the conduit through which a relatively small portion of the induced air may enter the conduit for supporting partial combustion of the gas flowing through the conduit, the said inlet end of the tube and the walls of said conduit being so arranged for air flow whereby they openly expose the interior of the tube beyond said conduit to the inflow of air from the atmosphere independently of said conduit and chamber.

5. The combination specified in claim 1, characterized by the inlet end of said conduit being in open communication with said chamber and in spaced relation to the inner walls thereof whereby some of the said gases may flow out of said chamber around as well as through the said conduit.

6. The combination specified in claim 3, characterized by the smaller of said tubular members having apertures in its side walls.

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