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ANNEALING APPARATUS

Original Filed March 26, 1934

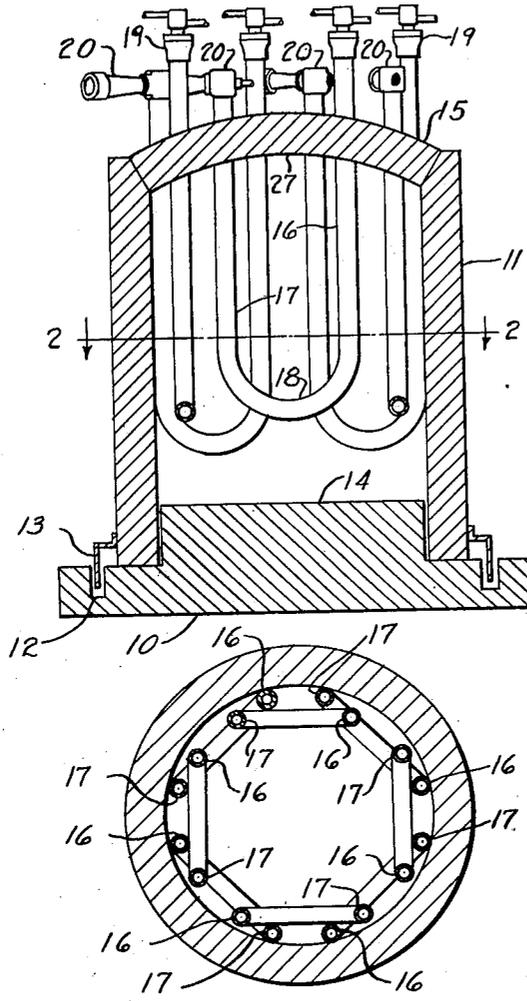


Fig. 1.

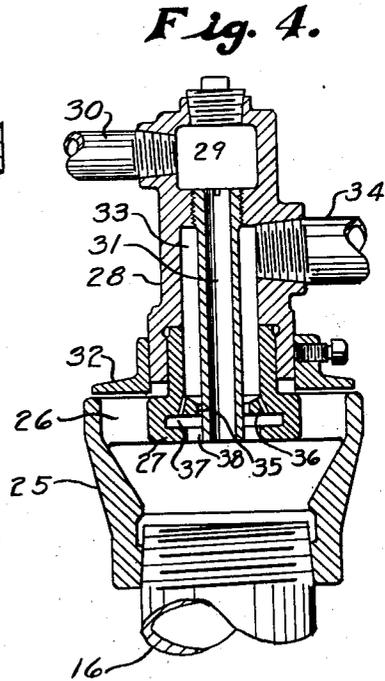


Fig. 4.

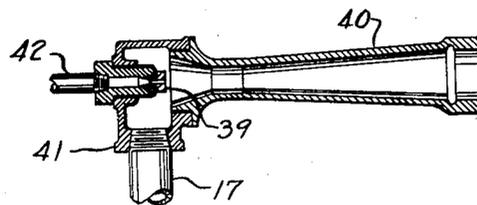


Fig. 3.

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## UNITED STATES PATENT OFFICE

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## ANNEALING APPARATUS

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Original application March 26, 1934, Serial No. 717,356. Divided and this application March 25, 1936, Serial No. 70,836

4 Claims. (Cl. 266—5)

This application is a division of our application filed March 26, 1934, Serial No. 717,356.

The present invention has for its object to provide, in combination with a structure forming a heating chamber, improved fuel-fired apparatus for producing radiant heat in said chamber to the end that material may be heat-treated, as for annealing, in an atmosphere devoid of deleterious gases of combustion. The invention is particularly well adapted for producing heat in a furnace chamber formed by bell type hood removably supported on a base whereon the material to be heat treated is supported, and will be described in connection with such a furnace.

Referring to the drawing wherein the preferred form of the invention is shown,—

Fig. 1 is a vertical sectional view of a bell type furnace showing the present invention associated therewith;

Fig. 2 is a horizontal section through the furnace on line 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional view of an exhaustor forming part of the heating apparatus, and

Fig. 4 is an enlarged sectional view of a burner forming part of the heating apparatus.

The base of the furnace is generally indicated at 10 and the heating hood at 11. The heating hood is removably seated on the base and the latter will usually be provided with a sand seal 12 for receiving a sealing flange 13 carried by the hood. The base will usually have a central upstanding portion 14 to form a seat for the material to be heat treated. Furnace chambers formed in the manner described are substantially gas tight and are well known in the art.

In accordance with the present invention, the apparatus for producing heat in the furnace chamber comprises a plurality of U-tubes which depend from the roof 15 of the hood to a point short of the furnace base whereby to permit the tubes to expand and contract in the direction of their length without touching said base. The two legs of each tube are indicated at 16 and 17, and the return bend at 18. At the top of one of the legs 16 of each tube is a burner generally indicated at 19 and at the top of the other leg 17 is an exhaustor generally indicated at 20.

As shown in Fig. 2, the tubes may be so arranged with respect to each other that one leg of each tube is between the two legs of the next adjacent tube, thereby permitting the use of a greater number of tubes along a wall than could

otherwise be used if the tubes were simply arranged side by side.

The burner 19 includes a flaring extension 25 forming part of the intake end of each tube. Positioned centrally axially in the extension as by ribs 26 is a hub 27 having an axial extension for supporting a tubular extension 28 having a chamber 29 at its outer end. Fuel gas is delivered to the chamber 29 by a gas supply pipe 30; and extending from the chamber is a gas discharge tube 31. The air for supporting combustion of the fuel discharged from the tube 31 is the air which is drawn into the upper end of the tube by the draft produced by the exhaustor 20 which (see Fig. 3) preferably comprises a discharge nozzle 39 set to discharge into a Venturi tube 40 which extends from a chambered fitting 41 wherein the nozzle is mounted, the fitting being suitably coupled to the exhaust end of the U-tube as will be readily understood, and air or other fluid under pressure is delivered to the nozzle 39 by a supply pipe 42.

A shutter 32 in front of the extension 25 controls the effective inlet area thereof. The fuel discharge tube 31 passes through a chamber 33 to which a preformed combustible mixture of air and fuel gas is delivered by a supply pipe 34. The mixture thus delivered to the chamber 33 flows therefrom through a relatively restricted passage 35 around the tube 31 adjacent its discharge end and serves, when ignited, as a tubular pilot flame for insuring ignition of the fuel issuing from the tube 31. To insure ignition of the mixture issuing from the passage 35, some of the mixture flows from the chamber 33 by way of a ring of outwardly diverging ports 36 which discharge into a shielded combustion groove 37 having an outlet 38 around the discharge end of fuel tube 31. The mixture thus issuing from the chamber 33 is initially ignited by inserting a flare into the mouth of the extension 25.

By firing the U-tube in the manner described and by further reason of the fact that the fuel receiving leg 16 of each tube is straight from its upper end to the bend of the tube, combustion proceeds relatively slowly as compared with a preformed mixture of air and fuel gas with the result that localized or spot heating of the tube is prevented.

Since the tubes depend into the furnace chamber from the roof thereof and the two legs of each tube are parallel and the bend is free and clear of the furnace base, it will be readily appreciated that the tubes may expand and con-

tract in the direction of their length without putting any strain on the furnace structure.

What we claim is:

1. Annealing apparatus comprising, in combination, a base for the material to be treated, a heating hood open at the bottom and adapted to be placed over the material and rest on the base, a plurality of internally fired heating tubes arranged along the inside wall of the hood, each tube being of U-form and having its inlet and outlet outside of the hood above the roof thereof.

2. The combination with a structure forming a furnace chamber, of means for producing heat in said chamber comprising a return bend tube having its bend more remote from the roof of the chamber than the distance between the legs of the tube and having its intake and discharge ends extending out of the chamber through said roof and being free to expand and contract in the direction of its length, and means for flowing heating gases through the tube.

3. The combination with a structure forming a furnace chamber, of means for producing heat in said chamber comprising a return bend tube extending into the chamber through the roof thereof and having its bend adjacent to but free and clear of the bottom of the chamber whereby the tube is free to expand and contract in the direction of its length, and means for flowing heating gases through the tube.

4. The combination with a structure forming a furnace chamber, of means for producing heat in said chamber comprising a plurality of return bend tubes having their bends remote from the roof of the chamber and having their legs extending out of the chamber through said roof, the tubes being so arranged with respect to each other that one leg of each tube is intermediate the two legs of the next adjacent tube, and means for flowing heating gases through the tubes.

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