

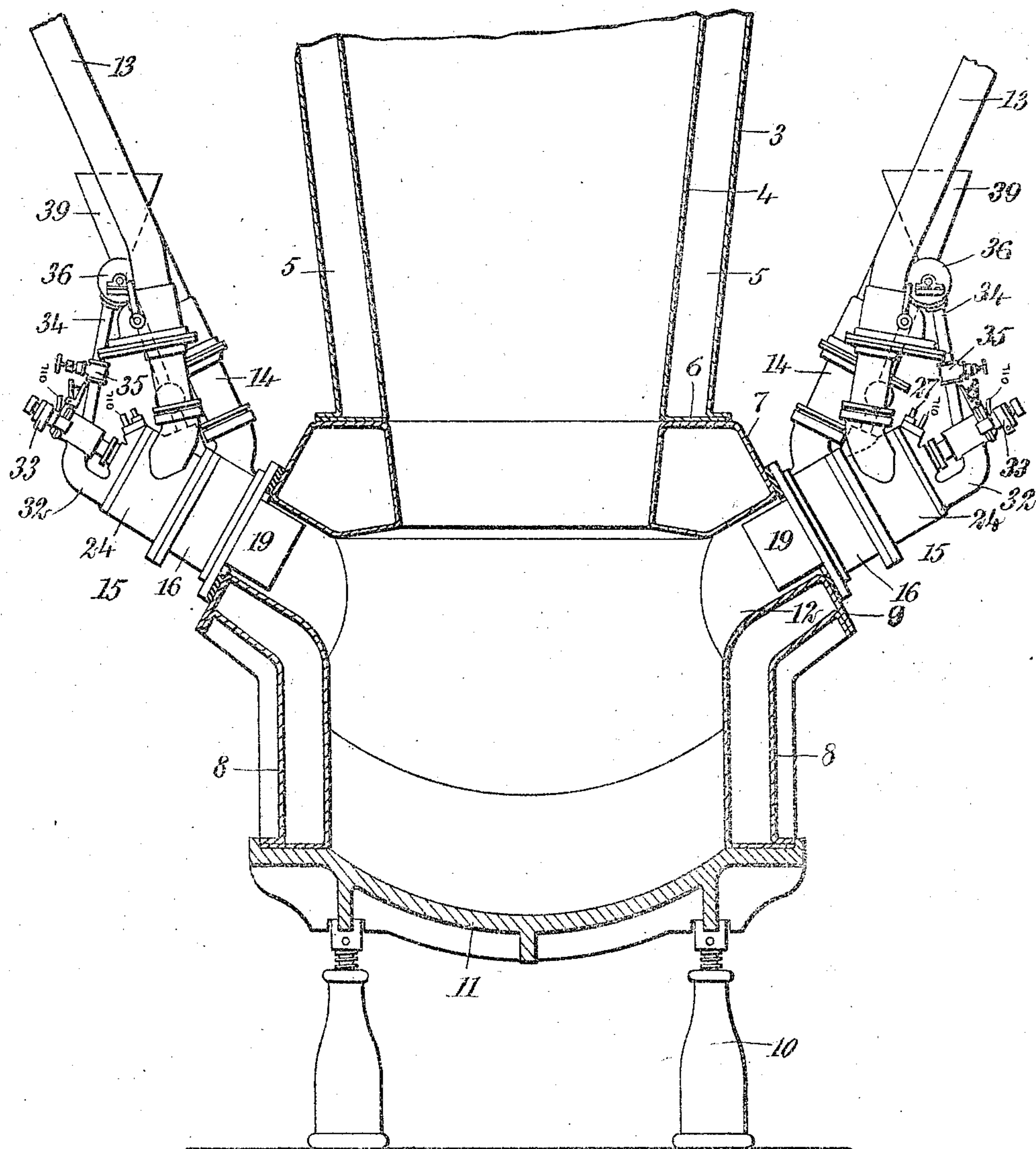
B. L. WORTHEN.
 APPARATUS FOR BURNING HYDROCARBON FUELS.
 APPLICATION FILED OCT. 18, 1907.

997,728.

Patented July 11, 1911.

2 SHEETS-SHEET 1.

Fig. 1



WITNESSES

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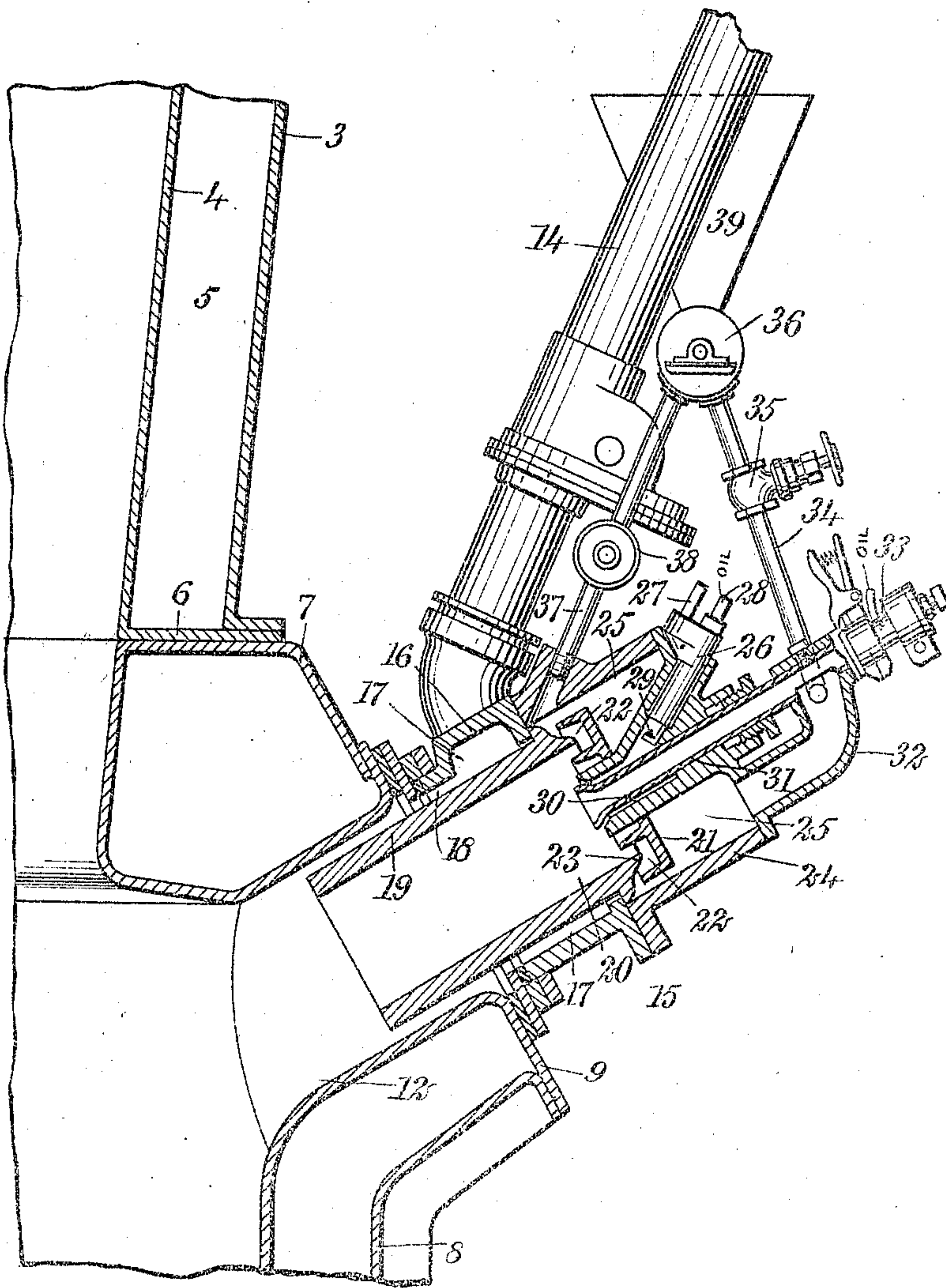
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Fig. 2



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UNITED STATES PATENT OFFICE.

BURT LINCOLN WORTHEN, OF TUCSON, ARIZONA TERRITORY.

APPARATUS FOR BURNING HYDROCARBON FUELS.

997,728.

Specification of Letters Patent. Patented July 11, 1911.

Application filed October 18, 1907. Serial No. 398,000.

To all whom it may concern:

Be it known that I, BURT L. WORTHEN, a citizen of the United States, and a resident of Tucson, in the county of Pima and Territory of Arizona, have invented a new and Improved Apparatus for Burning Hydrocarbon Fuels, of which the following is a full, clear, and exact description.

My invention relates to furnaces such as are employed for smelting and roasting ores, and for heating various media.

My more particular object is to introduce finely comminuted carbonaceous material into a preëxisting flame, and to supply air or its equivalent at the point of contact between the comminuted material and the flame, so as to insure perfect combustion, economy of materials, and a high degree of heat.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in both the views.

Figure 1 is a vertical section through a smelting furnace made in accordance with my invention and showing the mechanism used for feeding the comminuted, carbonaceous material, and also showing the main burner where this material is brought into contact with air and with a hydrocarbon flame, this view further showing the auxiliary burner for producing said flame; and Fig. 2 is an enlarged, fragmentary section through one of the main burners, this view showing the auxiliary burner in elevation, and also showing the various supply pipes for air and the comminuted carbonaceous material.

The inner and outer walls of the stack are shown at 3, 4, and are separated by spaces 5 to be filled with water, and provided with a bottom 6, these parts constituting a water-jacket. The base of this jacket is shown at 7 and may consist of a water ring, the parts just mentioned together constituting the so-called upper jacket. The lower water-jacket is shown at 8 and is connected directly with the fire-box 11 and supported therewith upon jacks 10. Intermediate the upper and lower water-jackets is an aperture 12. Twyer pipes 13, 14, which may, if desired, be connected with the bustle pipe, lead downwardly to the main burner 15. The twyer pipe 14 taps

into an annular section 16 inclosing an annular air space 17 which is continued obliquely downward at 18 so as to communicate with the aperture 12.

Both sides of the furnace are constructed exactly alike so that the mechanism shown in Fig. 2 is duplicated upon the opposite side of the furnace.

A burner tube is shown at 19 and is provided with a combustion chamber 20. A baffle 21 is provided with an annular space 22 into which projects the upper end 23 of the burner tube. The twyer pipe 13 taps into a section 24 which is provided with a space 25.

At 26 is shown a combining tube and connected with it is an air pipe 27 and an oil pipe 28. A baffle 29 is connected with the combining tube 26, the parts with the pipes 27, 28 just mentioned, together constituting a carbureter adapted to discharge a vapor, and this vapor passes into an annular passage 30 encircling the lower end of a tube 31. This lower end of the tube 31 is flared, as indicated in Fig. 2, for the purpose of giving proper shape to the flame to be produced. A pipe 32 communicates with the space 25 and is connected with an oil burner 33. This burner may be of any convenient form and is preferably adapted to burn crude oil. Leading into the pipe 32 is a smaller pipe 34 provided with a hand valve 35 and connected to a spiral conveyer 36. Another small pipe 37 is connected with this spiral conveyer and is provided with a hand valve 38. The pipe 37 taps into the section 24 and is therefore in communication with the space 25. A hopper is shown at 39 and from it the conveyer 36 takes the comminuted fuel and discharges it continuously into the pipes 34, 37.

The burner 33 produces a hydrocarbon flame which passes downwardly through the tube 31. The carbureter discharges a vapor into the annular passage 30 and as this passage entirely encircles the enlarged end of the tube 31 the vapor is brought into contact with the flame and surrounds the same. The lower end of the tube 30, because of its flaring shape and of the conformity of the adjacent parts, I have found from experience, tends to give the flame a substantially conical shape, air being supplied through the twyer pipes 13, 14. Air from the twyer pipe 14 passes downwardly into

the section 16 and into the furnace through the annular passage 17, and in doing this, it avoids excessive heating of the burner tube 19. Air also passes downwardly through the twyer pipe 18 and this air enters the space 25; here it divides, a part going obliquely upward through the pipe 32 and then passing obliquely downward through the tube 31, and another part passing obliquely downward (to the left, according to Fig. 2), so as to pass around the projecting end 23 of the burner tube. The pressure of the air passing around the projecting end 23 of the burner tube is neutralized by the pressure of the air passing through the pipe 32 and tube 31, so that no distortion of the flame is produced by the air currents.

Comminuted carbonaceous fuel being supplied by the hopper 39, and passing downward through the pipes 34, 37, is discharged into the pipe 32 and also at the top of the section 24, thus finding its way through the annular passage 22. While moving from the passage 22 into the burner tube, the comminuted fuel is brought into contact with the hydro-carbon flame and is most effectively consumed, producing a high degree of heat. The idea is to produce a hydro-carbon flame and to commingle with this flame under the action of an air-blast, the finely divided particles of carbonaceous fuel. The result is that the finely divided carbonaceous fuel is burned a while in suspension, the combustion taking place so rapidly as to be finished before the particles are driven beyond the reach of the flame.

Having thus described my invention I claim as new, and desire to secure by Letters Patent:—

1. A burner provided with a burner tube and with an air space encircling said burner tube, a baffle disposed adjacent to one end of said burner tube and provided with an annular space concentric thereto and into which the end of said burner tube projects, means for supplying pulverulent fuel to said annular space, mechanism for admitting oil substantially into the center of said burner tube, means for supplying air to said air space encircling the burner tube, the burner having an air space communicating with the interior of said burner tube through said annular space in the baffle, and means for supplying air to said air space.

2. A burner, comprising a burner tube, the burner having an annular air space encircling said tube, an air pipe communicating with said space for supplying air continuously around the tube, means for maintaining a flame within said burner tube, a baffle provided with an annular space into which projects the rear end of the burner tube, the said burner having an air space communicating with the interior of the

burner tube by means of said annular space in the baffle, an air pipe communicating with said air space, and means controllable at will for distributing pulverulent fuel to said air space adjacent to said annular space between the baffle and the burner tube.

3. In a burner, the combination with a main burner tube, of a carbureter connected with the main burner tube for supplying a combustible mixture thereto, an auxiliary burner for lighting said combustible mixture, means for regulating said auxiliary burner, a baffle through which the auxiliary burner extends, the baffle having an annular space into which projects one end of the main burner tube, the burner having an air space communicating with the main burner tube by means of the annular space in the baffle, and means for supplying carbonaceous fuel to said annular space between the baffle and the end of the main burner tube.

4. In a burner, the combination with a main burner tube, of an auxiliary burner tube, a baffle through which the front end of the auxiliary burner extends, the said baffle having an annular space into which projects the upper end of the main burner tube, a carbureter communicating with an annular passage encircling the front part of the auxiliary burner tube, the burner having an air space communicating with the main burner tube by means of the annular space in the baffle, a pipe connecting said air space with the auxiliary burner, means for supplying carbonaceous fuel to said annular space between the baffle and the main burner tube, and means for supplying air to said air space.

5. In a burner, the combination with a main burner tube, the burner having an annular air space encircling said tube, and an air pipe communicating with said space for supplying air around the tube, of a baffle provided with an annular space into which projects the rear end of said main burner tube, the burner having an air space communicating with the interior of the main burner tube by means of said annular space in the baffle, an air pipe communicating with said air space, an auxiliary burner tube extending into the rear end of the main burner tube, an oil burner connected with said auxiliary burner tube, a pipe connecting said air space with the auxiliary burner tube, and means for discharging comminuted carbonaceous fuel into the said pipe, and into the space between the main burner tube and the baffle.

6. The combination in a burner having a section provided with an air space, of means for supplying air thereto, a main burner tube, a baffle disposed adjacent to one end of said tube and spaced apart therefrom, the space between the baffle and tube communicating with said air space, an auxiliary

burner extending through said baffle into the
main burner tube, a carbureter having its
discharge connected with an annular passage
encircling the end of said auxiliary burner,
5 a connection between said air space and the
auxiliary burner, a supply of pulverulent
fuel, a pipe connecting said fuel supply with
said connection, and a second pipe connect-
ing said fuel supply with the said air space

adjacent to the space between the baffle and 10
the end of the main burner tube.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

BURT LINCOLN WORTHEN.

Witnesses:

CHAS. F. SLACK,
D. C. GRIFFIN.