

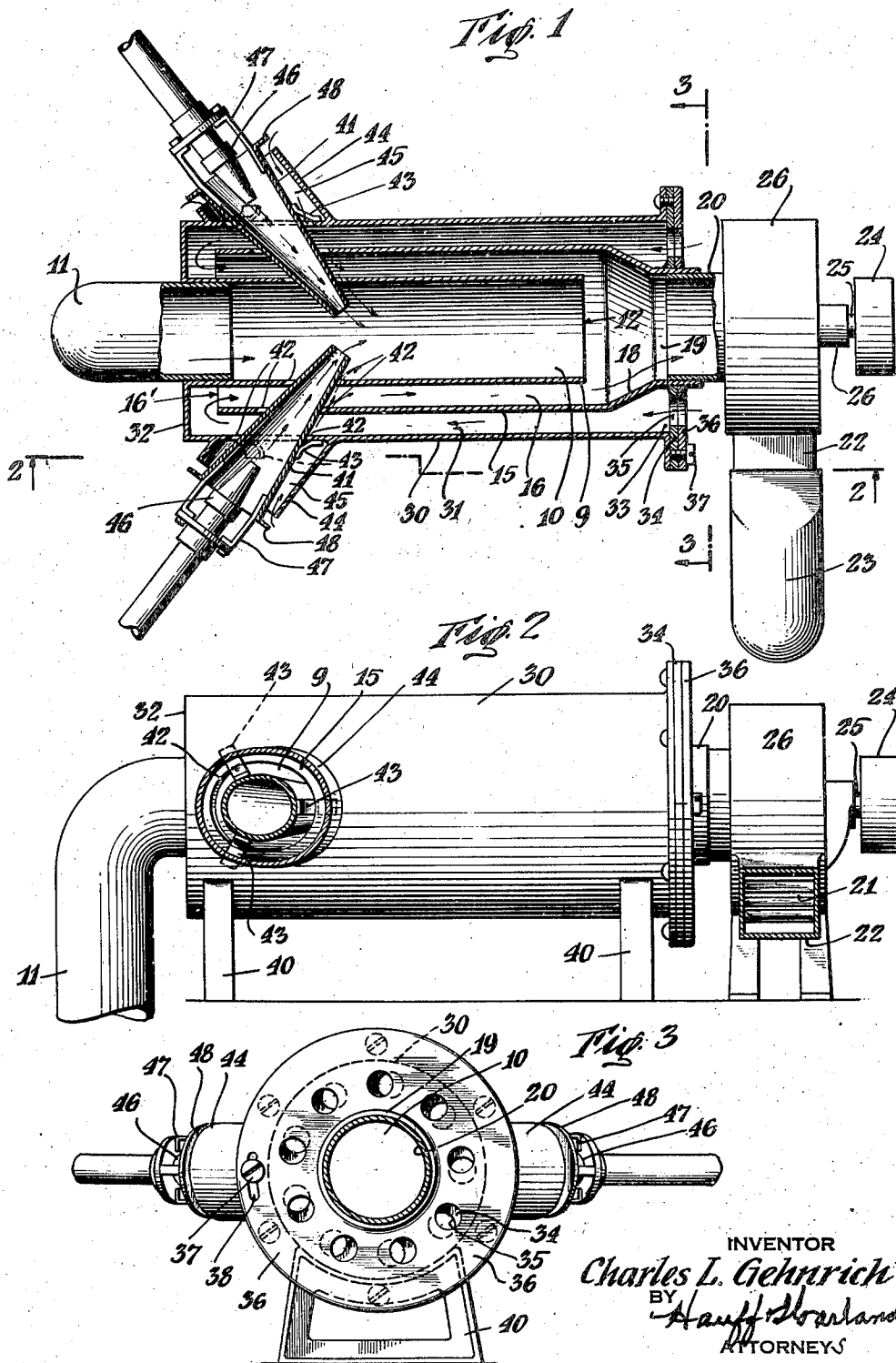
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INDUSTRIAL HEATER

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INDUSTRIAL HEATER

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This invention relates to heaters and more particularly to heaters for supplying hot gases for industrial uses.

An object of the invention is to provide a lightweight, inexpensive, convenient, efficient and dependable heater of the above type.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

10 A feature of the invention consists in the elimination of refractory material from the combustion chamber with a consequent reduction in both the cost and the weight of the unit.

Another feature consists in the arrangement of 15 the various parts to prevent dissipation and waste of heat.

Another feature consists in the arrangement of the burner and combustion chamber so as to prevent the flame from being extinguished by a sudden draft.

Another feature consists in the provision of supporting means for the combustion chamber by which it is spaced from the various ducts so as to eliminate direct transfer of heat.

25 Other features consist in the various details of construction and combinations of parts hereinafter more fully set forth.

Although the novel features which are believed to be characteristic of this invention will be more particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages and the manner of its operation, may be better understood by referring to the following description taken in connection with the accompanying drawing in which one embodiment of the invention has been set forth for purposes of illustration.

In the drawing:

Fig. 1 is a horizontal section through a heater 40 embodying the present invention;

Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1; and

Fig. 3 is a transverse section taken on the line 3—3 of Fig. 1.

45 In the following description and in the claims, certain specific terms are used for convenience in referring to various details of the invention. It is to be understood, however, that these terms are to be given as broad an interpretation as the state of the art will permit.

Referring to the drawing more in detail, the heater is shown as comprising a cylindrical wall 9 forming a central, elongated heating chamber 10 55 through which the hot gases are passed in a man-

ner to be described. The heating chamber 10 communicates at its intake end with a pipe 11 through which recirculated hot gases or other intake gases such as air may be supplied. The other end 12 of the heating chamber 10 is open for the discharge of the heated gases.

A casing 15 surrounds the wall 9 of the heating chamber 10 and is spaced therefrom to provide an air duct 16 through which air or other gases to be heated are passed. The casing 15 is provided 10 with an open end 18 and at its other end communicates with a tapered mixing chamber 18 having a discharge port 19. The mixing chamber 18 and the discharge port 19 are preferably coaxial with the open end 12 of the heating chamber 10 and receive gases both from the heating chamber 10 and from the air duct 16. The discharge port 19 of the mixing chamber 18 communicates with the intake 20 of a fan or blower 21 having a housing 26 provided with a discharge 20 port 22 communicating with a pipe 23 which leads the products of combustion to a furnace or other space to be heated. The blower 21 may be operated from a suitable source of power by means of a belt pulley 24 mounted upon a shaft 25 which 25 is journaled in the housing 26 of the blower.

A housing 30 surrounds the casing 15 and is spaced therefrom to provide an air duct 31. The end 32 of the housing 30 which is adjacent the end 16 of the casing 15 is closed so that the air 30 is caused to pass through the ducts 31 and 16 in the direction indicated by the arrows. The open end 33 of the housing 30 may be provided with an aperture plate 34 having a plurality of apertures 35 through which the air is drawn. A second similar aperture plate 36 may be secured in alignment with the aperture plate 34 and may be adjusted as by screws 37 and elongated slots 38 so as to vary the effective opening of the various 40 apertures.

It is to be noted that the open end 33 of the housing 30 is arranged so that the air is drawn into the duct 31 over the fan or blower 21 and serves to cool the same as it passes on its way to 45 the heater. The housing 30 may be supported in any convenient manner as by brackets 40, and the casing 15 and the wall 9 may be suitably supported by said housing.

One or more combustion chambers 41 extend 50 diagonally through the housing 30, the casing 15 and the walls of the heating chamber 10. The combustion chambers may be spaced as desired around the heating chamber. In the embodiment shown there are two combustion chambers 10- 55

cated on opposite sides of the heating chamber near one end thereof. The combustion chambers 41 are formed of metal and do not contain any refractory material. At their inner ends they are of a size adapted to pass the required amount of air for combustion. They are tapered outwardly and are of greater cross sectional area near the burners so as to reduce the air velocity at the burners for preventing flare back or blowing out of the flame. The housing 30, casing 15 and wall 9 are provided with apertures 42 around each combustion chamber 41, which apertures are sufficiently large to provide an air space for the passage of air around said combustion chamber and to prevent the combustion chamber from contacting with the metal walls of the heater.

Each combustion chamber may be supported by a plurality of spaced lugs 43 which are secured to the housing 30. The combustion chamber 41 may either rest upon or be secured to said lugs. The lugs form the only mechanical connection between the combustion chamber and the other metal parts of the heater and thereby reduce the heat transfer from the combustion chamber and provide for independent expansion of the combustion chamber. A tubular member 44 may be secured to the housing 30 and may surround the projecting portion of each combustion chamber 41, being spaced therefrom to provide a duct 45 through which air for cooling the combustion chamber may pass. Radial baffles 48 may be secured to the combustion chambers 41 to extend partly over the duct 45 so as to separate the air streams within and without the combustion chamber and to minimize the disturbance of the flame by air being drawn into the ducts 45. A burner 46 is inserted in the open end of each combustion chamber 41 and may be supported by convenient means, such as, brackets 47. The burners 46 are adapted to burn gaseous or liquid fuel, preferably under pressure sufficient to cause the flame to project a substantial distance beyond the tip of the burner. The open end of the combustion chamber provides an air duct around the burner 46 in which air for combustion is drawn.

In the operation of this device, suction is created by the blower 21 which draws air through the combustion chambers 41 and through the ducts 45 and apertures 42 around the exterior of the combustion chambers. The blower also draws air or hot gases through the pipe 11 and into and through the heating chamber 10 to the mixing chamber 18, which gases are mingled with the products of combustion received from the combustion chambers 41. At the same time air is drawn through the apertures 35 and the ducts 31 and 16 into the mixing chamber 18 where it is mixed with the hot gases from the heating chamber 10.

The air for supporting combustion passes through the combustion chambers and is discharged into the heating chamber. The burners are located in the open end of the combustion chambers where the air velocity is the lowest. Hence, the tendency of the flame to blow out, or flare back, is minimized. The temperature of the flame is sufficient to heat the walls of the combustion chambers to radiance. This heat, however, is prevented from being transferred to the other metal parts of the heater by reason of the spacing of the combustion chambers therefrom and by the cold air which is drawn through the duct 45 and around the exterior of the combustion chambers.

In certain instances the pipe 11 may be omitted and cold air admitted directly to the heating

chamber 10. The pipe 11 may be used when desired to recirculate hot air from the oven or other space being heated through the heater.

The cold air which is drawn into the ducts 31 and 16 serves to cool the casing and to prevent dissipation of heat therefrom. The cold air drawn over the casing of the blower 21 operates as a cooling medium therefor. The air is preheated to some extent during its passage through ducts 31 and 16 and enters the mixing chamber 18 at an elevated temperature. By controlling the relative quantity of air admitted through the apertures 35 and the quantity of hot gases admitted through the pipe 11, the operation of the device may be varied as desired. Suitable means not shown may also be provided for controlling the rate of combustion in the combustion chambers 41.

The above heater serves to produce hot gases and to deliver the same at any desired velocity to the space to be heated. The apparatus is comparatively light because of the absence of refractory material and may be readily and cheaply installed in any desired location. The particular cooling means employed prevents the burning out of the metal walls of the combustion chamber and at the same time serves to preheat the air prior to introduction thereof into the mixing chamber. The tapered combustion chambers provide a hot metal wall on which the flame impinges. This feature assists in obtaining complete combustion. The entire device is efficient because of the use of all available heat and the prevention of heat loss through the walls. The metal combustion chamber has a practically indefinite life and at the same time reduces the weight and cost of the device.

Obviously, various types of suction means may be employed or in some instances the blower may be omitted and the device operated by natural or forced draft or the blower may be connected to provide pressure instead of suction. A preferred embodiment has been described for purposes of illustration only.

Although one embodiment of the invention has been described in detail, it is obvious that various changes and modifications may be made therein as will be apparent to a person skilled in the art. Hence the scope of the invention is to be limited only in accordance with the following claims when interpreted in view of the prior art.

I claim:

1. A heater for supplying hot gases comprising an elongated heating chamber having intake and discharge openings at opposite ends, an open ended combustion chamber having metal walls extending through the side walls of said heating chamber and spaced therefrom to provide an air duct around the combustion chamber walls, a burner located in the open end of said combustion chamber to direct a flame therein and means to draw heated gases through said heating chamber, air for combustion through the open ended combustion chamber and air for cooling through the air duct around said combustion chamber.

2. A heater for supplying hot gases comprising an elongated heating chamber having intake and discharge openings at opposite ends, an open ended combustion chamber having metal walls extending through the side walls of said heating chamber, said combustion chamber being inclined to the axis of said heating chamber in the direction of gas flow and being spaced from the walls of said heating chamber to provide an air duct

around the combustion chamber walls, a burner located in the open end of said combustion chamber to direct a flame therein and means to draw heated gases through said heating chamber, air for combustion through the open ended combustion chamber and air for cooling through the air duct around said combustion chamber.

3. A heater for supplying hot gases comprising an elongated heating chamber having intake and discharge openings at opposite ends, an open ended combustion chamber having metal walls extending through the side walls of said heating chamber and spaced therefrom to provide an air duct around the combustion chamber walls, a burner located in the open end of said combustion chamber to direct a flame therein and means communicating with said heating chamber to draw heated gases through said heating chamber, air for combustion through the open ended combustion chamber and air for cooling through the air duct around said combustion chamber, said combustion chamber being tapered inwardly so that the inner end limits the quantity of air passed therethrough and the velocity of the air is reduced opposite the burner to prevent disturbance of the flame.

4. A heater for supplying hot gases comprising an elongated heating chamber having intake and discharge openings at opposite ends, a tapered open ended combustion chamber having metal walls extending through the side walls of said heating chamber and spaced therefrom to provide an air duct around the combustion chamber walls, a burner located in the open end of said combustion chamber to direct a flame therein, a suction blower communicating with the discharge end of said heating chamber to draw heated gases through said heating chamber and to draw air for combustion through the open ended combustion chamber and air for cooling through the air duct around said combustion chamber and members forming a pair of concentric air ducts around said heating chamber, one of said ducts having an open end adjacent said blower arranged so that the cool air is drawn over the blower on its way to said duct, said ducts intercommunicating so that said air is drawn over said blower through the outer duct and thence in the reverse direction through the inner duct.

5. A heater for supplying hot gases comprising an elongated heating chamber having air intake and discharge openings at opposite ends, a suction blower communicating with the discharge opening, a combustion chamber communicating with said heating chamber and adapted to supply hot combustion gases thereto and members forming a pair of communicating concentric air ducts around said heating chamber through which air passes successively in opposite directions, the inner duct terminating in a position to discharge air to said blower and the outer duct having its intake opening in a position to draw cold air over the blower housing on its way to said duct.

6. A heater for supplying hot gases comprising an elongated heating chamber having air intake and discharge openings at opposite ends, a combustion chamber communicating with said heating chamber to supply hot combustion gases thereto, a mixing chamber communicating with said discharge opening to receive the hot gases from said heating chamber, a suction blower communicating with said mixing chamber to draw the hot gases therefrom, and members disposed around said heating chamber and forming a pair of concentric air ducts through which air

flows successively in opposite directions, the outer duct having an air intake opening located to draw air over said blower, the inner duct discharging to said mixing chamber, whereby the air from said ducts is mixed with the heated gases received from said heating chamber, before passing to said suction blower.

7. A heater for supplying hot gases comprising an elongated heating chamber having inlet and discharge ports, members around said heating chamber forming a pair of concentric air ducts through which air is drawn successively in opposite directions for extracting heat from the walls of said heating chamber, the inner duct having a discharge port adjacent the discharge port of said heating chamber, an open ended combustion chamber extending through said members and through the side wall of said heating chamber and spaced therefrom to provide an air passage around the outer surface of said combustion chamber, a burner located in the open end of said combustion chamber and blower means communicating with said heating chamber, inner duct and combustion chamber to pass hot gases through said heating chamber, air for cooling the walls of said heating chamber through said ducts, air for combustion through said combustion chamber and air for cooling the walls of said combustion chamber through the air passage around said walls.

8. A heater for supplying hot gases comprising an elongated heating chamber having inlet and discharge ports, members around said heating chamber forming a pair of concentric air ducts through which air is drawn successively in opposite directions for extracting heat from the walls of said heating chamber, a mixing chamber receiving gases from said heating chamber and from said ducts, an open ended, combustion chamber extending through said members and through the side wall of said heating chamber and separated therefrom to provide an air passage around the outer surface of said combustion chamber, a burner located in the open end of said combustion chamber and means communicating with said mixing chamber, inner duct and combustion chamber to pass hot gases through said heating chamber, air for cooling the walls of said heating chamber through said ducts, air for combustion through said combustion chamber and air for cooling the walls of said combustion chamber through the air passage around said walls, said combustion chamber being tapered so that the quantity of air is limited by the cross-sectional area of its inner end and the air velocity is reduced at the outer end opposite the burner.

9. A heater for supplying hot gases comprising an elongated heating chamber, an open ended combustion chamber extending through the side walls of said heating chamber and spaced therefrom to provide an air duct around the outer surface of said combustion chamber, a mixing chamber communicating with said heating chamber and adapted to receive hot gases therefrom, members disposed around said combustion chamber and forming a pair of concentric air ducts through which air flows successively in opposite directions, on its way to said mixing chamber, and a suction blower communicating with said mixing chamber to draw combustion gases through said combustion chamber, gases for heating through said heating chamber and air through all of said ducts into said mixing chamber, the outer concentric duct having an intake opening

located to draw air over said blower on its way to said duct.

10. A heater for supplying hot gases comprising an elongated heating chamber, means to
 5 supply gases thereto for heating an open ended combustion chamber extending through the side walls of said heating chamber to supply hot gases thereto, spaced lugs supporting said combustion chamber in spaced relationship with said side
 10 walls to provide an air duct around the outer surface of said combustion chamber and to prevent direct transfer of heat to said walls, a mixing chamber communicating with said heating chamber and adapted to receive hot gases therefrom,
 15 members disposed around said combustion chamber and forming a pair of concentric air ducts through which air flows successively in opposite directions, on its way to said mixing chamber, and a suction blower communicating with said
 20 mixing chamber to draw combustion gases through said combustion chamber, gases for heating through said heating chamber and air through all of said ducts into said mixing chamber, the outer concentric duct having an intake
 25 opening located to draw air over said blower on its way to said duct.

11. A heater for supplying hot gases comprising an elongated heating chamber, means to supply gases thereto for heating a suction blower
 30 adapted to draw the hot gases therefrom, members disposed around said heating chamber and forming a pair of concentric air ducts through which air flows successively in opposite directions, for extracting heat from the walls of said heating chamber, an open ended combustion chamber
 35

extending through the side walls of said heating chamber to supply hot gases thereto, said combustion chamber being spaced from said side walls to provide an air passage around the outer surface of said combustion chamber through
 5 which air is drawn by said suction blower, a casing around the projecting portion of said combustion chamber forming therewith an air duct, spaced lugs supporting said combustion chamber out of contact with the walls of said heating
 10 chamber and a burner located in the open end of said combustion chamber in a position to direct a flame therein.

12. A heater for supplying hot gases comprising an elongated heating chamber having inlet
 15 port to receive gases for heating and a discharge port for the hot gases, members around said heating chamber forming a pair of concentric air ducts through which air is drawn successively in opposite directions for extracting heat from the
 20 walls of said heating chamber, the outer duct having an adjustable inlet port comprising a pair of relatively movable aperture plates, an open ended combustion chamber extending through said members and through the wall of
 25 said heating chamber to supply hot gases thereto, a burner located in the open end of said combustion chamber and a suction blower associated with said heating chamber adapted to draw hot gases through said heating chamber, air for cooling
 30 the walls of said heated chamber through said ducts and air for combustion through said combustion chamber.

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