

No. 741,504.

PATENTED OCT. 13, 1903.

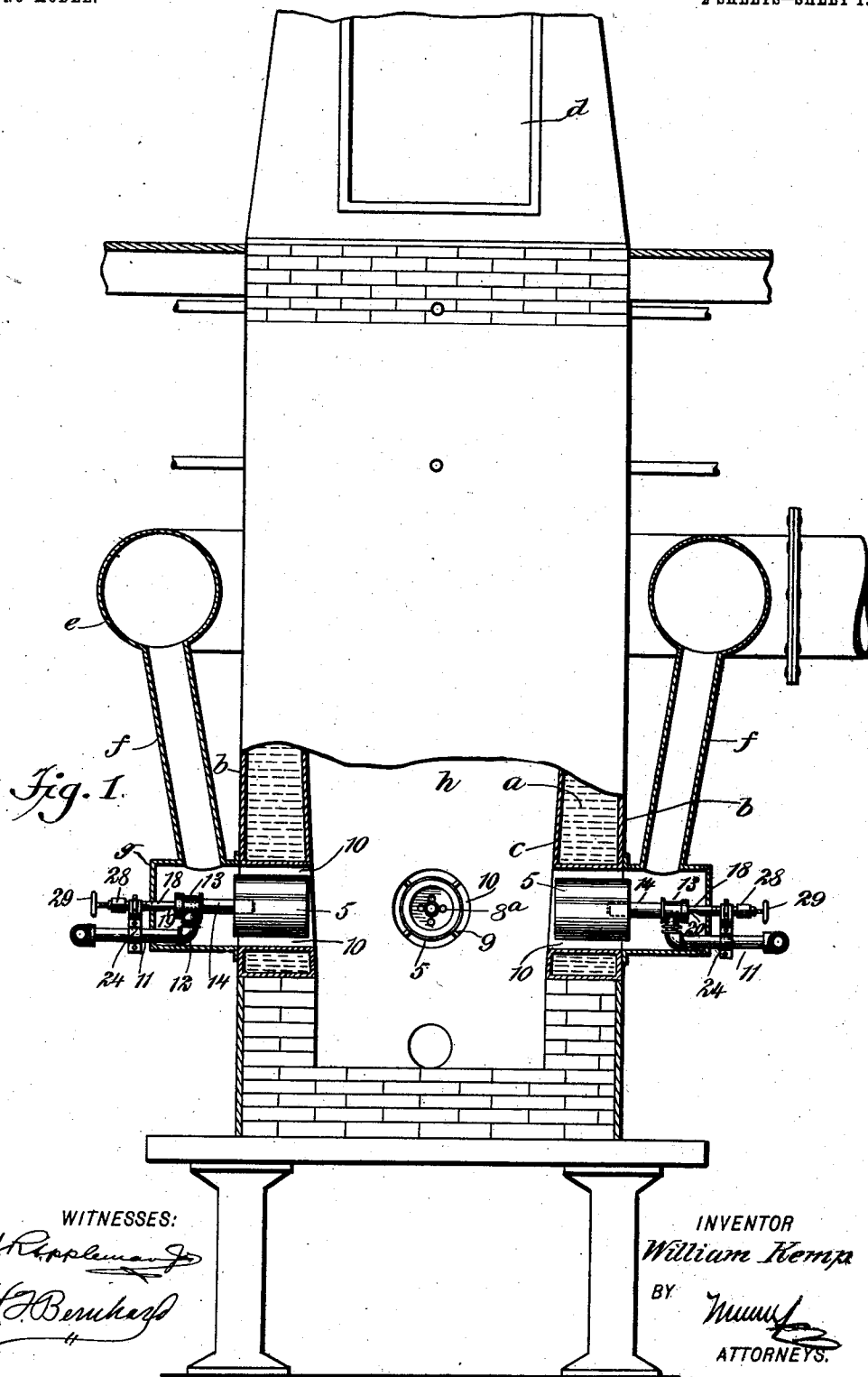
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APPLICATION FILED AUG. 7, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



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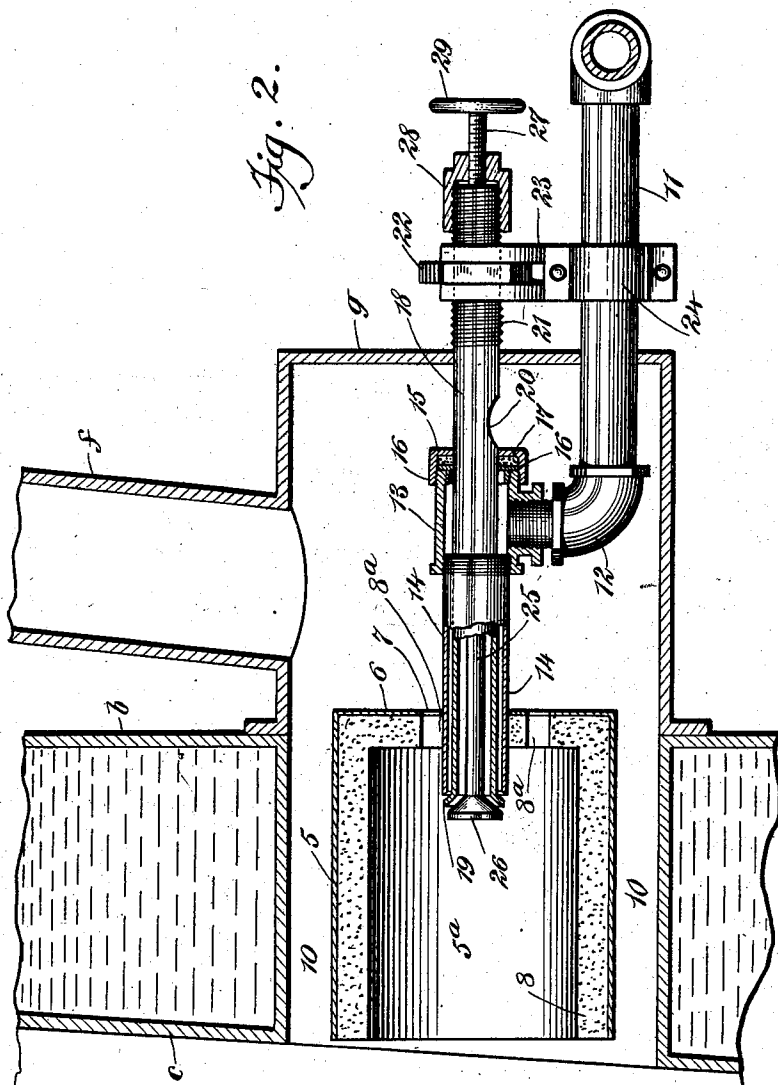
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APPLICATION FILED AUG. 7, 1902.

NO MODEL.

2 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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MEANS FOR UTILIZING OIL OR GAS IN ORE-REDUCING FURNACES.

SPECIFICATION forming part of Letters Patent No. 741,504, dated October 13, 1903.

Application filed August 7, 1902. Serial No. 118,746. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM KEMP, a citizen of the United States, and a resident of Tucson, in the county of Pima and Territory of Arizona, have invented certain new and useful Improvements in Means for Utilizing Oil or Gas in Ore-Reducing Furnaces, of which the following is a full, clear, and exact description.

My invention relates to means for utilizing oil or gas in ore-reducing furnaces; and the objects that I have in view are, first, to equalize the flow and pressure of air around and to the flame at that part of the burner within a combustion-chamber; to provide for the circulation of the air-blast around the shell of the combustion-chamber, so as to afford protection to the shell against the intense heat in the furnace; to provide means for regulating the inflow of air and the liquid or gaseous fuel independently of each other, to the end that an intense or modified heat may be produced and the parts are normally under control of an attendant, and to simplify the construction in a way to promote the durability and reduce the cost of installation and repairs.

With these ends in view the invention consists in the novel combination of devices and in the construction and arrangement of parts, as will be hereinafter fully described.

The actual scope of the invention will be defined by the claims.

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 figures.

Figure 1 is a sectional elevation of a part of an ordinary ore-reducing furnace embodying my improved means for utilizing oil or gas as a means for intensifying the heat in the combustion-chamber of the furnace; and Fig. 2 is an enlarged vertical sectional view through one of the vapor-burners, parts thereof being shown in elevation and other parts in section.

The water-jacket *a* of the ordinary ore-reducing furnace is formed between the exterior shell *b* and the inner lining *c*. The furnace is provided with an ordinary charging-

door *d*, and around the furnace is arranged the main blast-pipe *e*, from which extends a series of twyer-pipes *f*, the latter communicating with the wind-box *g*, which is arranged to supply the twyer of the furnace. All these parts are of the usual or any preferred construction, and they may be modified as desired.

In connection with the wind-box and the twyer-openings of the blast-furnace I employ one or a series of burners adapted to consume gaseous fuel or a hydrocarbon, and in Fig. 1 of the drawings I have shown the ore-reducing furnace as equipped with a series of three burners, one of which is shown in end view, while the two remaining burners are shown in vertical sectional elevation. These burners in construction and installation are identically the same, so that a description of one will answer for each of the others.

In the twyer-opening is arranged a shell *5*, adapted to form a combustion-chamber for the fuel and air supplied thereto by devices of my invention. This shell *5* of the combustion-chamber may be of any desired shape in cross-section—such, for example, as square, rectangular, or otherwise—but as shown by the drawings the shell is cylindrical and open at its inner end. The shell is preferably made of metal and provided at its outer end with a head *6*, the latter having a large central opening *7*. To protect the shell from the deteriorating influence of heat in the furnace, it is provided with a refractory lining *8*, which may consist of fire-brick, clay, or other suitable material, and this lining is arranged to extend across the head *6* on the interior thereof, the end portion of the lining having an opening *8^a* coincident with the opening *7* in the head of the shell. The width or diameter of the shell is less than that of the twyer-opening in which the shell is arranged, and this shell is thus supported in the twyer-opening by a plurality of lugs *9*, which extend radially from the shell and are adapted to be secured within the twyer-opening by any approved means. This arrangement of the shell in the twyer-opening provides a surrounding or annular passage

which has direct communication with the wind-box *g* and with a working chamber *h* of the furnace.

11 designates the fuel-supply pipe, which
5 extends through the wind-box *g* and is provided with an elbow 12, the upper end of which is attached in a suitable way to the coupling 13. In one end of this coupling is secured the fuel pipe or tube 14 of the burner;
10 but the other end of the coupling is closed by means of a gland 15, which is arranged to inclose a head 16 in such a way as to form a chamber adapted to receive a packing 17. (See Fig. 2.) Through the head 16, packing
15 17, and the gland 15 is passed an air-supply tube 18, the latter being of sufficient length to extend entirely through the fuel-tube 14 and the outer side of the wind-box *g*. The inner extremity of this air-tube 18 is enlarged or flared in order to form a valve
20 member 19, the same being disposed beyond the inner extremity of the fuel-tube 14, the latter being formed in such a way as to produce a seat for the valve member 19. This
25 air-tube 18 is also provided at a point beyond the gland 15 with a port or opening 20, which lies within the wind-box *g* and allows the air or blast to pass directly from the wind-box into the air-tube. The air-tube is furthermore provided with a male screw-thread 21
30 on that part thereof which is exposed beyond or outside of the wind-box, and on this threaded part of the air-tube is screwed an adjusting-nut 22, the latter being held or confined in the forked or slotted end 23 of a
35 bracket 24, which is supported in a stationary position outside of the wind-box—as, for example, by attaching the bracket to the fuel-supply pipe 11. The nut 22 is always exposed
40 for convenient access by an operator, and this nut may be turned within the forked or slotted bracket in a manner to adjust the air-tube 18 in the direction of its length, thereby regulating the position of the valve
45 member 19 with relation to the inner end of the fuel tube or pipe 14 of the burner.

25 designates a valve-stem which extends longitudinally through the air-tube 18, and the inner end of this stem is provided with a
50 valve 26, the latter having a flared or conical face adapted to be seated against the outer face of the valve member 19 on the air-tube 18. The outer end of the valve-stem 25 is prolonged or extended beyond the threaded
55 part of the air-tube 18, and said valve-stem is also provided with an exterior thread 27, which is screwed into a threaded opening provided in the closed end of a cap 28, the latter being in turn screwed on the threaded
60 end 21 of the air-tube. The projecting or exposed end 27 of the valve-stem 25 is provided with a hand-wheel 29 or other suitable device for turning the valve-stem, thus making provision for adjustment of the valve-
65 stem 25 and the valve 26, so as to regulate

the area of the opening through which the air is discharged at the inner end of the air-tube 18.

By reference to Fig. 2 it will be seen that the inner end of the fuel-tube 14 and the
70 flared end 19 of the air-tube are extended or carried through the openings 7 8^a of the shell 5 and the lining thereof. The inner ends of the fuel and air tubes, comprising parts of the burner, are thus projected well into the
75 combustion-chamber 5^a, and the air is supplied to the flame at the inner end of the burner through the openings 7 8^a and through the inner end of the air-tube 18, thus equalizing the volume and pressure of air which
80 is supplied to the flame. It will be observed also that the valve 26 may be adjusted independently of the air-tube, because the hand-wheel 29 on the stem 26 may be
85 turned in the cap 28, so as to vary the distance of the valve 26 from the flared mouth or valve member 19 of the air-tube. The valve-tube 18 may also be adjusted by turning the nut 22 in a direction to impart end-
90 wise movement to the tube 18 and change the position of its nut or valve member 19 with relation to the end of the fuel-tube 14, whereby the control of the fuel and of the air may be changed to admit greater or less volumes
95 of fuel or air, or both, in order to maintain an intense or modified heat in the combustion-chamber 5^a.

In the operation of the furnace the series of burners are employed at the same time that the blast is admitted to the working
100 chamber *h*. The fuel is carried through the pipe 11 and its elbow 12 to the coupling 13 and through the annular space provided between the tubes 14 18, the fuel finding an exit
105 at the inner end of the tube 14 and around the flared mouth or valve member 19 of the tube 18. The air from the wind-box *g* is free to pass through the opening 20 into the air-tube 18, and the air under pressure is forced through the flared end or valve mem-
110 ber 19 within the annular flame caused by the combustion of the fuel which is supplied by the tube 14. At the same time the air from the wind-box *g* is free to pass through
115 the openings 7 8^a of the shell 5, and thus air is supplied to the flame within and without the same, whereby the combustion of the fuel is maintained to the best advantage within the combustion-chamber 5^a. The heat and
120 products of combustion are free to pass from the chamber 5^a directly into the working chamber *h*, because the shell 5 is opened at its inner end.

The packing 17 in the coupling prevents the leakage of the fuel into the wind-box *g*,
125 and when the burner is in service the blast from the wind-box *g* is free to pass into the working chamber *h* through the passages 10, which surround the shell 5 of the combustion-chamber, whereby said shell is in a measure
130

protected from the action of the deteriorating influence of the intense heat from the ore under treatment in the working chamber *h*.

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

1. An ore-reducing furnace having a twyer-opening and a combustion-chamber situated in the twyer-opening and communicating with the working chamber of the furnace and with a wind-box, a burner extending into said combustion-chamber, and means for supplying fuel to said burner.

2. An ore-reducing furnace having in addition to a twyer-opening and a wind-box, a combustion-chamber which is situated within the twyer-opening so as to leave surrounding air-passages which communicate directly with the wind-box and with the working chamber, a burner extending into said combustion-chamber, and means for supplying fuel to the burner.

3. An ore-reducing furnace having a twyer-opening and a combustion-chamber situated in a twyer-opening communicating with a wind-box, said combustion-chamber being arranged to form with the twyer-opening an intermediate space which surrounds the chamber, and a burner having tubes extending into the combustion-chamber, one of said tubes being provided with an air-inlet that communicates with the wind-box.

4. In an ore-reducing furnace, the combination of a twyer-opening, a combustion-chamber situated in a twyer-opening, so as to form therewith an intermediate space which surrounds said combustion-chamber, a burner air-pipe extending into the combustion-chamber and communicating with the chamber of the wind-box, and means for supplying fuel to the combustion-chamber around the air-exit from the air-tube.

5. In an ore-reducing furnace, the combi-

nation of a twyer-opening, a combustion-chamber situated in a twyer-opening and communicating with a wind-box, said combustion-chamber being arranged to form with the twyer-opening an intermediate space which surrounds said chamber, an air pipe or tube also communicating with the wind-box and extending into the combustion-chamber to discharge air directly therein, a surrounding fuel-tube concentric with the air tube or pipe and discharging into the combustion-chamber around the air-inlet afforded by the tube, and means for supplying air from the wind-box directly to the combustion-chamber around the fuel-tube.

6. In an ore-reducing furnace, in combination, a twyer-opening, a wind-box, a combustion-chamber in communication with the wind-box, and a burner having a fuel-conduit and an internal air-conduit, said burner being located in said combustion-chamber and adapted to produce a flame which is supplied with air under pressure both internally and externally by the internal conduit and the combustion-chamber respectively.

7. In an ore-reducing furnace, in combination, a twyer-opening, a wind-box, a combustion-chamber located in said twyer-opening and communicating with the wind-box, an annular burner located in the combustion-chamber, means for supplying gaseous fuel to said burner, and an air-conduit in communication with the wind-box and located centrally with respect to said fuel-supply means of the burner.

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

WILLIAM KEMP.

Witnesses:

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DALE M. TUSSING.