(No Model.)

J. F. BARKER.

CRUCIBLE FURNACE.

No. 444,658. Patented Jan. 13, 1891.

Fig. 1.

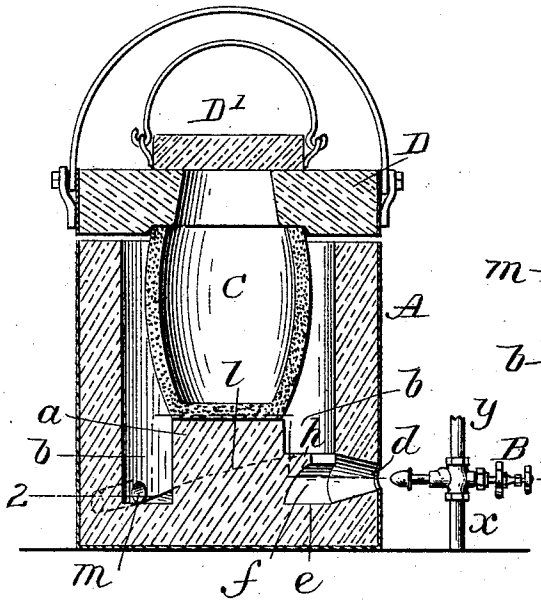


Fig. 2.

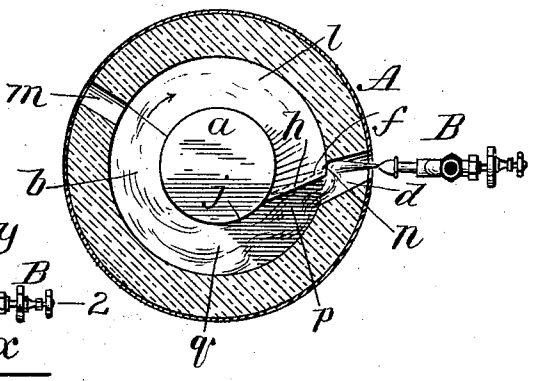
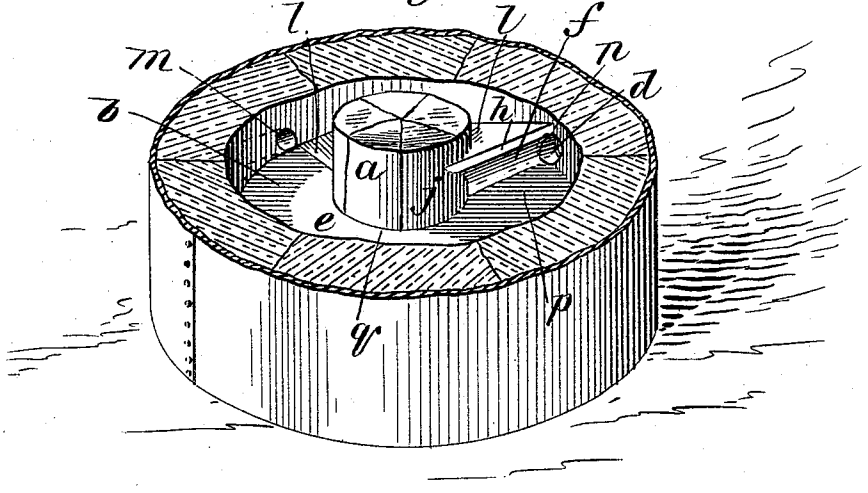


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN F. BARKER, OF SPRINGFIELD, MASSACHUSETTS.

CRUCIBLE-FURNACE.

SPECIFICATION forming part of Letters Patent No. 444,658, dated January 13, 1891.

Application filed September 22, 1890. Serial No. 365,719. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. BARKER, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Crucible-Furnaces, of which the following is a specification.

This invention relates to crucible-furnaces especially intended for melting brass and copper, and wherein the fuel employed is crude hydrocarbon commingled with air, the object of the invention being to improve the construction of the furnace, whereby the fuel is disposed and controlled within the furnace and in relation to the crucible for most efficient results entirely consistent with the utmost economy.

It will be here stated that so far as is known to me there has always been heretofore in the running of hydrocarbon crucible-furnaces where the proper degree and intensity of heat has been established within the furnace and directly upon the crucible, a consequential effect by the fuel and products of combustion upon and detrimental to the crucible, and such an effect has rendered questionable the utility of hydrocarbon fuel for crucible heating. It will be noted on inspection of the flame within the furnace-chamber of a hydrocarbon and compressed air introduced thereunto from an injector-burner, that as the combustion takes place somewhat in advance of the burner-nozzle, the flame is blue due to the fact that the combustion is still imperfect and the liquid nature of the hydrocarbon has not been entirely overcome, and as the flame moves forwardly under the blast from the burner and the combustion is consummated such latter stage of the combustion is of a gas practically non-liquid in its nature and having no capability for saturation. A flame caused by but partially-consumed crude petroleum in its impingement upon the sides of the crucible permeates or saturates same more or less thoroughly, and combustion in a certain degree taking place within the thickness of the crucible-walls causes the same to chip or flake off and the crucible to become worthless in a very short time; and to the end of a most effectual introduction and controlling of the products of combustion within the furnace-chamber, and in relation to the crucible therein, whereby a maximum heating effect is insured and the detrimental effects upon the crucible, as above indicated, are avoided, the present invention consists in a furnace comprising peculiar structural features, all substantially as will hereinafter more fully appear and be set forth in the claims.

In the drawings accompanying, the present improved crucible-furnace is illustrated, Figure 1 being a central vertical section thereof. Fig. 2 is a horizontal section taken about on the plane indicated by the line 2 2, Fig. 1. Fig. 3 is a perspective view, on a larger scale, in illustration of the construction of the bottom of the furnace, the upper portion of the circular furnace-walls being broken away.

A represents a furnace having essentially an interior chamber of cylindrical form, the furnace here shown being externally also of cylindrical form, which is open near the top, and in the bottom thereof there is provided a pedestal or crucible stand *a*, which rises a short distance above the floor or bottom of the furnace and of a circular form, the diameter of which is less than that of the furnace-chamber, there being between the sides of said pedestal and the inner furnace-wall the annular space *b*.

The furnace is to be formed of a suitable fire-brick or other refractory material, and, as shown, is surrounded by a sheet-iron casing. The crucible-stand may be constructed, as shown particularly in Fig. 3, of segments of fire-brick, which conduce to form the cylindrical stand, or the said crucible-stand may be formed of a single solid cylindrical portion of the fire-brick, if desired.

c represents an opening through the side wall of the furnace horizontally entering at or slightly above the level of the bottom *e*, and preferably, as shown in Fig. 2, in a direction about tangential with the crucible-stand *a*. A barrier or wall *f* is provided substantially as shown, which extends more or less nearly tangentially from the side of the pedestal at a line about opposite to the center of said opening *d* across the annular space *b*, said wall joining the inner vertical wall of the furnace just within the border of the said opening *d*, especially as to the upper part of

said wall, which is in the form of an overhanging ledge, which is on a level as high as or a little higher than the top of the opening *d*, as indicated in the drawings by *h*, the face of said wall below said ledge being undercut, and said undercut wall portion with the overhanging top forms an effectual means for holding the oil and air introduced at the inlet-opening *d* from rising as it moves forwardly from the inner orifice of the inlet toward and alongside of the portion *j* of said pedestal.

The bottom of the furnace around under the annular space *b* and in advance of the said point *j* relative to the direction of the fuel-current inclines upwardly at a gradual angle, terminating at the said ledge *h*, the said inclined bottom portion of the furnace (indicated by *l*) being in the form of a spiral segment.

B represents an injector-burner for a hydrocarbon fuel, the nozzle of which is placed opposite said inlet-opening *d* of the furnace, oil being supplied to said burner through a suitable pipe *x* and air through the pipe *y*, which leads from an air-compressor, and there is preferably a vent or draft opening through the side wall of the furnace near the bottom thereof more or less nearly opposite the said inlet-opening, and as shown at *m*.

D and D′ are the lids for the furnace, and, as shown, the one D rests upon the top edge of the crucible C, which is shown as extended slightly above the top of the furnace, leaving a slight space between the furnace-top and the said lid D.

In operation fuel entered through the inlet-opening is directed for impingement against the corner *n* of the said wall *f*, or that part next to and joining the inner wall of the furnace, and, igniting, burns near the bottom of the furnace, and at and about the point indicated by *p* is as a blue flame and one more or less liquid in its nature; but as the products of combustion proceed a little farther—for instance, about to the point indicated by *q*—a non-liquid and more highly inflammable gas has been developed and the flame has lost its blue tinge and is such an one as may be directed without injury to and upon the crucible, and as the liquid fuel and products of combustion entered into the furnace under a suitable pressure are given a whirling motion within the furnace, as will be clear as a result of the circular construction, the said fuel and products of combustion by the said spiral segmental portion *l* of the floor are given an upward direction, which spiral direction of movement is further developed and continued round and round in the furnace until the effect and intensity of the heat have become exhausted, and then only to be supplanted by a new ingress of combustible matter at the opening *d*.

Practical tests and demonstration of the furnace described for the combustion therein of aerated hydrocarbon fuel has demonstrated that while the heat action upon the crucible is many times less detrimental than has been the case in a hydrocarbon-furnace devoid of the simple and important features of construction described, the amount of fuel necessary in this furnace for a maximum heating effect for the crucible and its contents is no greater than in the best metal-melting furnace heretofore employed.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A metal-melting furnace having a cylindrically-formed furnace-chamber and a centrally-disposed crucible-stand rising from the furnace-bottom a short distance and of a diameter less than that of the furnace-chamber, an opening leading through the side of the furnace near its bottom, and a barrier or wall extending from about one side border of said opening across the annular space in the bottom of the furnace and tangentially toward said crucible-stand, for the purpose set forth.

2. A metal-melting furnace having a cylindrically-formed furnace-chamber and a centrally-disposed crucible-stand rising from the furnace-bottom a short distance and of a diameter less than that of the furnace-chamber, an opening leading through the side of the furnace near its bottom, and a barrier or wall extending from about one side border of said opening across the annular space in the bottom of the furnace and tangentially toward said crucible-stand, combined with an injector-burner for introducing hydrocarbon fuel through said opening into the furnace, for the purpose set forth.

3. A metal-melting furnace having a cylindrically-formed furnace-chamber with a circular bottom and a centrally-disposed crucible-stand rising a short distance from the said circular bottom and of a diameter less than that of the furnace-chamber, and an opening leading through the side of the furnace above its bottom, a portion of said furnace-bottom being inclined or in the form of a segment of a spiral, substantially as shown, combined with an injector-burner for introducing hydrocarbon fuel through said opening into the furnace, substantially as and for the purpose described.

4. A metal-melting furnace having a cylindrically-formed furnace-chamber and a centrally-disposed crucible-stand rising from the bottom of the furnace-chamber a short distance and of a diameter less than that of said furnace-chamber, an opening leading through the side of the furnace near its bottom, and a barrier or wall extending from about one side border of said opening across the annular space in the bottom of the furnace tangentially toward said crucible-stand, the top of said wall being in the form of an overhanging ledge *h*, which is on a level above the top of said opening, for the purpose set forth.

5. A metal-melting furnace having a cylindrically-formed furnace-chamber and a cen-

trally-disposed crucible-stand rising from the bottom of the furnace-chamber a short distance and of a diameter less than that of said furnace-chamber, an opening leading through the side of the furnace near its bottom, and a barrier or wall extending from about one side border of said opening across the annular space in the bottom of the furnace tangentially toward said crucible-stand, the top of said wall being in the form of an overhanging ledge *h*, which is on a level above the top of said opening, and a portion of said furnace-bottom being formed inclined, substantially as described and shown, and for the purposes set forth.

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Witnesses:
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