Feb. 8, 1938. B. E. GAVIN 2,107,439

FURNACE BURNER

Filed Dec. 31, 1935 2 Sheets-Sheet 1

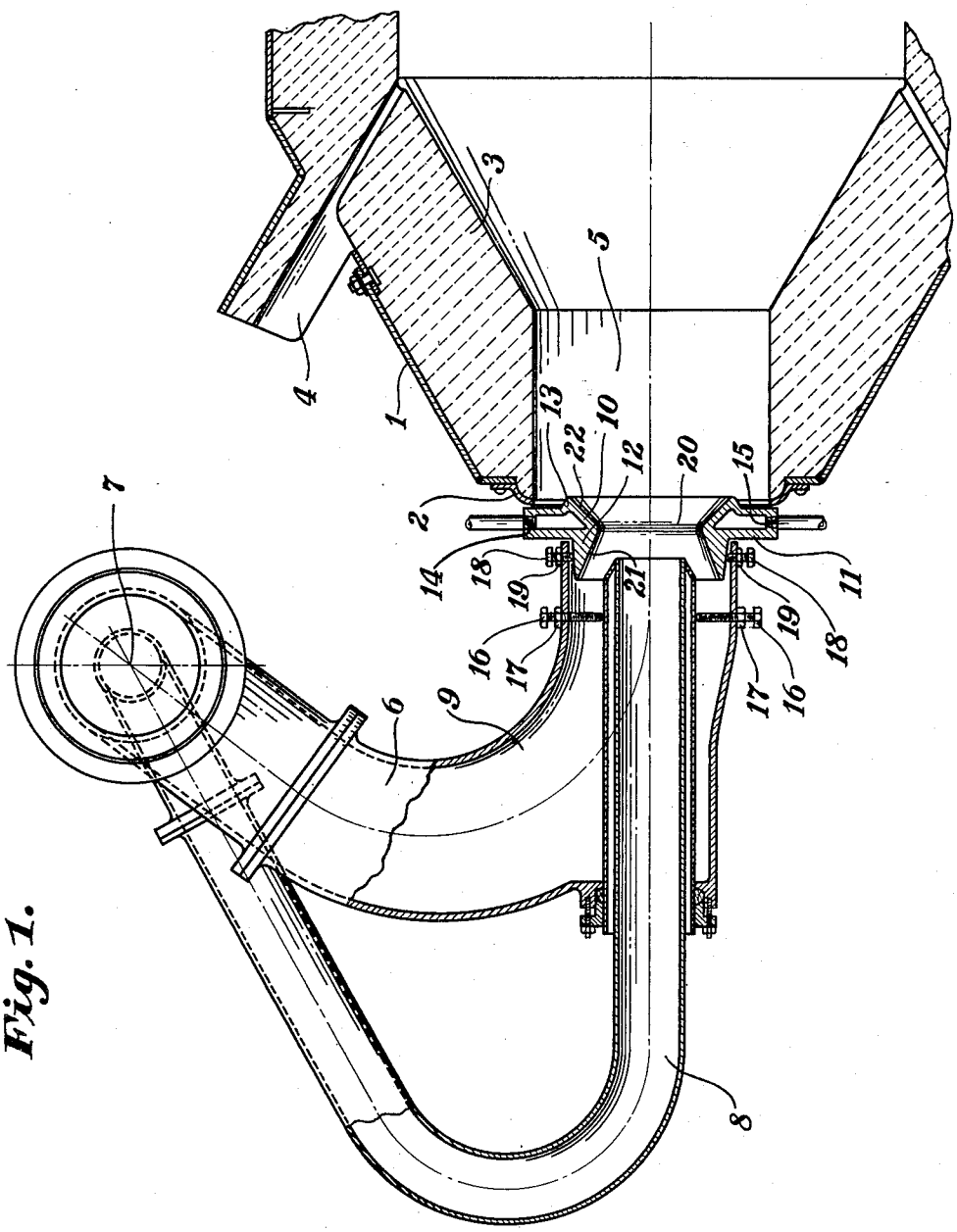


Fig. 1.

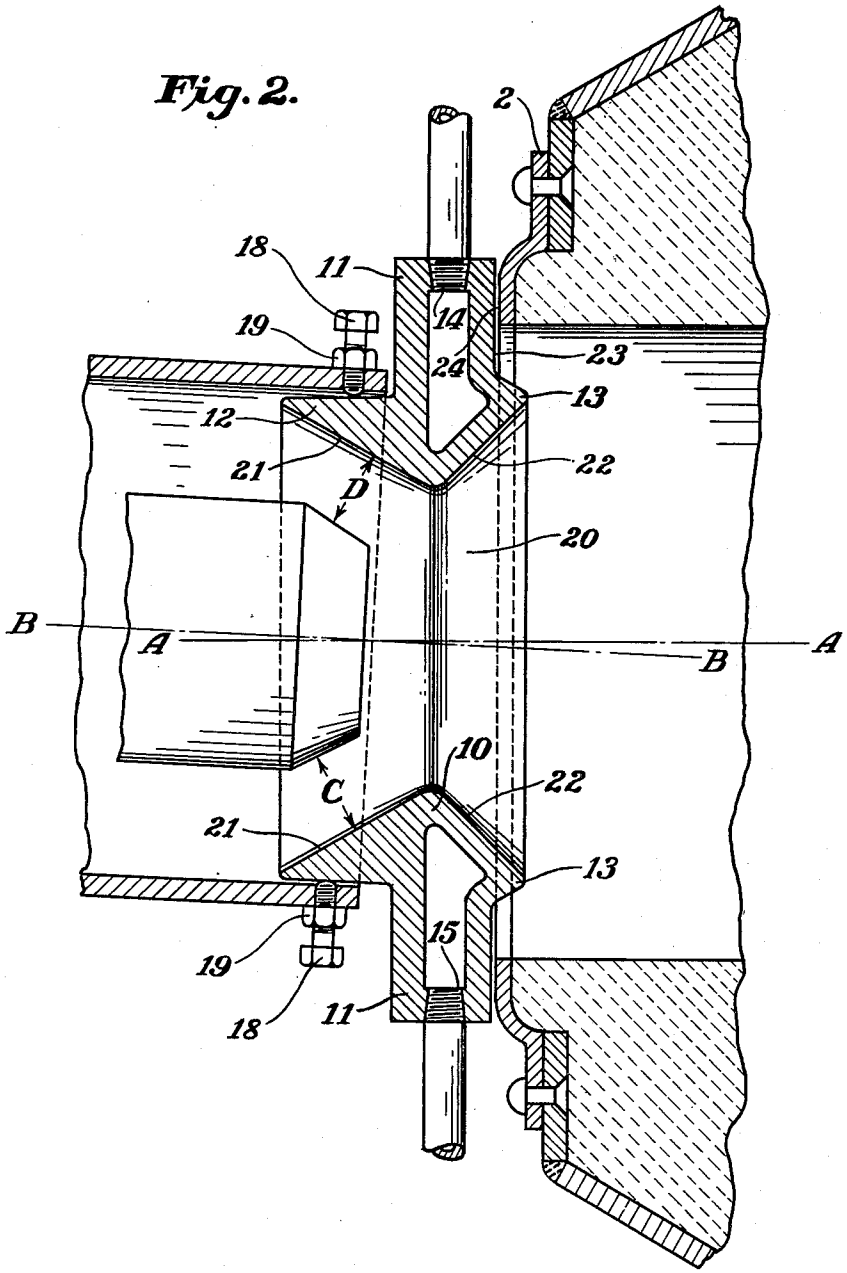
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Fig. 2.



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FURNACE BURNER

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7 Claims. (Cl. 263—33)

This invention relates to rotary furnaces used in melting iron, steel or the like, and more particularly concerns the construction of the burner by which the charge is heated.

Furnaces of the type with which this invention deals are adapted to rotate about their longitudinal axes and therefore the burner, which does not rotate about the axis of the furnace, can not be formed as an integral part thereof but must be maintained in as close proximity thereto as possible in order to prevent the escape of heat and hot gases between the furnace end and the burner. It is customary to pivotally mount the whole burner including the air and fuel ducts so that the same can be quickly and easily swung away from the end of the furnace when the latter is to be charged or poured. The usual practice is to provide an end-flange for the burner, integral with the end of the air duct, so that when the burner is in position the end-flange lies in close proximity to an opening in the end of the furnace through which the flame and hot gases pass to heat the charge of metal. This burner end-flange is made parallel to the end of the furnace when the structure is first built. However, expansion of the furnace, when heated, causes the burner end thereof to move toward the burner and in effect rotates the latter away from the furnace so that the burner end-flange is no longer parallel thereto. In other words, the burner is rotated such that its horizontal axis is at an angle to the horizontal axis of the furnace.

The burner end-flange can not be set at any fixed angle to the end of the furnace to take care of expansion thereof since this expansion, and subsequent contraction upon cooling, is very irregular and the furnace may not expand to the same point every time it is heated. Furthermore, it is at times necessary to change the outer shell of the furnace and the end of the new shell may not be in the same position relative to the burner as the old shell.

As a result of the burner end-flange being at an angle to the end of the furnace, a gap is caused between these members which permits some of the flame from the burner to escape outside the furnace, resulting in loss of fuel, burning of the burner end-flange and burning of the adjacent end of the furnace, necessitating frequent replacement of these parts.

The principal object of this invention is to provide a burner end-flange that is adjustable with respect to the end of the furnace so that regardless of the longitudinal position of the end of the furnace, the burner end-flange may be placed parallel to the end thereof. Another object is to provide a water-cooled burner end-flange to further assist in preventing burning of the parts. Other objects and advantages will be apparent from the following description taken in conjunction with the drawings of which:

Figure 1 is a horizontal sectional view through an end of a furnace and burner with a part of the burner shown in plan, and

Figure 2 is an enlarged horizontal sectional view through the end of the furnace and burner.

Referring to Figure 1 of the drawings, there is shown an end of the furnace of the rotary type having a metal covering or shell 1 and a metal end-flange 2. The furnace is lined with refractory material 3 and is provided with a series of pouring gates 4. An opening 5 is used both to charge the furnace and to provide a port for receiving the flame and hot gases from the burner. The furnace is mounted upon rollers (not shown) for rotation about its horizontal axis. The burner generally designated at 6 is pivotally mounted about a vertical axis 7 and comprises a duct 8 through which is blown by air pressure the fuel, such as powdered coal, oil or other material to be used in heating the furnace. Another duct 9 surrounds the fuel duct and through it is forced, under pressure, the additional air required to form a combustible mixture with the fuel. In charging or pouring the furnace, the burner assembly is first moved as a unit about the axis 7, thus providing access to the pouring and charging gates 4 and 5. At the end of ducts 8 and 9 there is provided an end-flange 10 formed with a hollow cylindrical portion 11, and having a projection 12 extending into the air duct, and another projection 13 extending into the end of the furnace opening 5. The outer surface of projection 12 may be formed cylindrical or conical, the latter being shown in the drawings. Sufficient clearance should be maintained between the outer surface of projection 12 and the inner surface of the air duct 9 to permit the required amount of angling between the end-flange and burner. The cylindrical portion 11 may be provided with openings 14 and 15 for receiving pipes for conveying cooling water through the hollow part thereof.

The end of the fuel duct may be positioned with respect to the air duct by means of bolts 16 provided with lock nuts 17. A plurality of these bolts may be placed around the circumference of the burner. The burner end-flange is adjustably mounted in the end of the air duct by means of

circumferentially spaced bolts 18 which engage the outer surface of the projection 12 of said burner end-flange. These bolts may also be provided with lock nuts 19. An opening 20 is formed in member 10 through which the hot gases pass and may be in the shape of a pair of intersecting conic surfaces 21 and 22. The particular shape of these surfaces is not material to my invention but may be any shape that will properly direct the flame from the burner into the furnace.

In Figure 2 the dot-and-dash line A—A represents the axis of the furnace and the line B—B represents the axis of the burner when it is caused to assume a position at an angle to the furnace due to the latter being expanded from heat. The burner end-flange 10 is shown adjusted so that the surface 23 is parallel to the surface 24 of the end-flange 2 of the furnace. It is, of course, not desirable to maintain surfaces 23 and 24 in contact since rotation of the furnace would cause wear. It is sufficient, however, that they be placed together as close as possible so as to cut down the heat and flame loss to a minimum. It has been found that by the use of this adjustable burner end-flange, burning of the latter and also of the furnace end-flange is practically eliminated.

Adjustment of the end-flange 10 is accomplished by first loosening the nuts 19 and bolts 18, after which the end-flange may be angled the desired amount. The bolts and nuts are then tightened to maintain the end-flange at this angle.

It will be noted that with the axis of the burner at an angle to the axis of the furnace the flame will tend to strike the portion of the furnace represented by the lower side in Figure 2. This is undesirable since it causes rapid deterioration of the refractory material. However, with my adjustable burner end-flange it will be seen that when the burner is angled with respect to the furnace, the air space represented by the distance C between the fuel duct and one portion of wall 21 is greater than distance D between the fuel duct and the opposite portion of wall 21. As a result, a greater volume of air passes between the space C which tends to blow the flame back on the center line A—A of the furnace.

It will be understood that while I have shown only one type of adjustable connection between the burner and end-flange, others, such as a ball-and-socket arrangement, could be used without departing from the spirit of my invention.

The terms and expressions which I have employed are used as terms of description and not of limitation, and I have no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof, but recognize that various modifications are possible within the scope of the invention claimed.

What I claim is:

1. In combination with a rotary melting furnace, a pivotally mounted burner, a burner end-flange and means for adjustably mounting said burner end-flange in a plurality of fixed angled positions with respect to said burner.

2. In combination with a rotary melting furnace, a pivotally mounted burner, a member fixedly mounted on an end of said burner and adapted to lie adjacent said furnace and means for varying the angle between said member and said burner.

3. In combination with a rotary furnace, a burner, an end-flange having a portion extending into said burner and a portion adapted to lie adjacent an end of said furnace, and means including said first named portion for adjustably securing said end-flange to said burner so as to maintain said second portion parallel to said end of said furnace.

4. In combination with a rotary furnace, a burner end-flange comprising a hollow central portion adapted to be positioned adjacent an end of said furnace and a pair of projections extending from said portion, one of said projections extending into said burner for adjustably securing said end-flange thereto and the other of said projections extending into overlapping relation with said furnace.

5. In combination with a rotary melting furnace, a burner mounted for pivotal movement about a vertical axis and comprising a hollow member positioned adjacent an end of the furnace, a burner element adjustably mounted on said member between the end of the latter and the furnace, said element having an opening therein for passage of hot gases from said burner into the furnace, the walls of said opening being formed by intersecting conic surfaces.

6. In combination with a rotary melting furnace, a pivotally mounted burner adapted to assume various angled positions relative to said furnace when in operating relation thereto, said burner comprising a pair of concentric ducts for discharge of fuel and air, a member positioned in the opening between said ducts, and means comprising said member for directing the flame from said burner into the furnace substantially parallel to the walls thereof when said burner is in an angled position relative to said furnace.

7. In combination with a rotary melting furnace, a pivotally mounted burner adapted to assume various angled positions relative to said furnace when in operating relation thereto and comprising a pair of concentric spaced hollow members, an element between an end of said furnace and said burner, said element having a portion extending into the space between said members, said portion having an inner surface adapted to direct the flame from said burner into the furnace, and means comprising said portion for changing the direction of the flame when said burner is in one of said angled positions.

BEAUFORD E. GAVIN.