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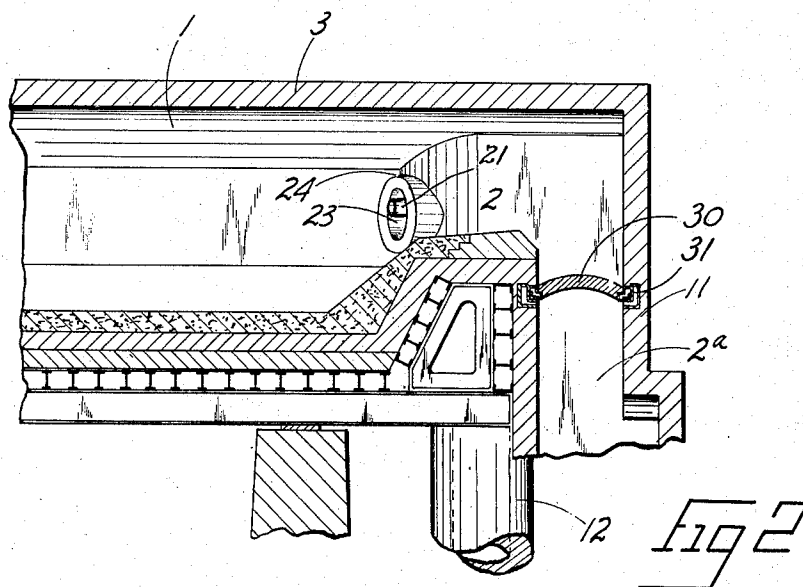
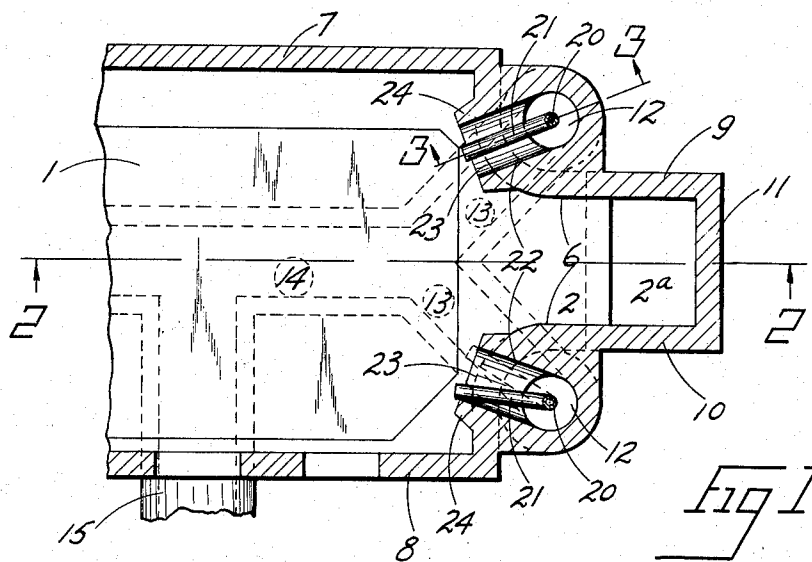
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2,021,245

END WALL CONSTRUCTION FOR OPEN HEARTH FURNACES

Filed Feb. 11, 1933

2 Sheets-Sheet 1



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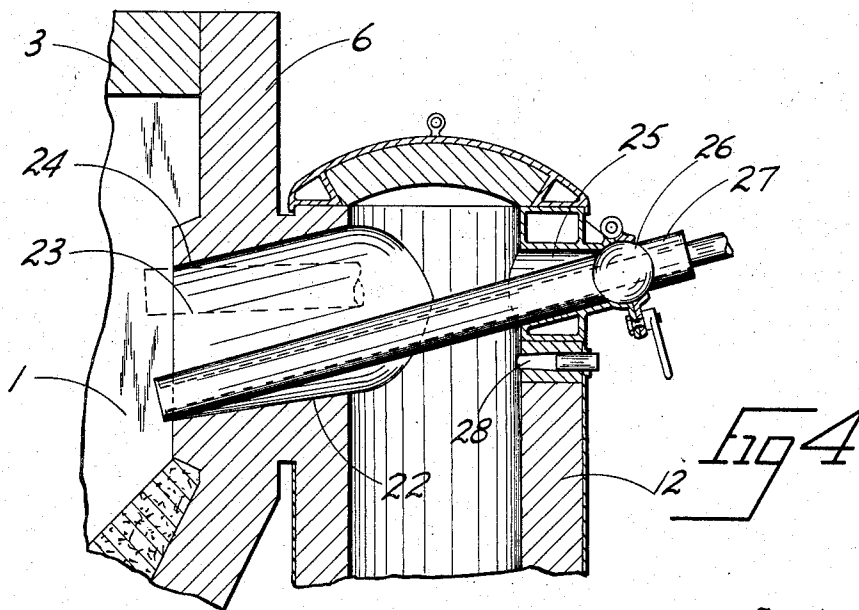
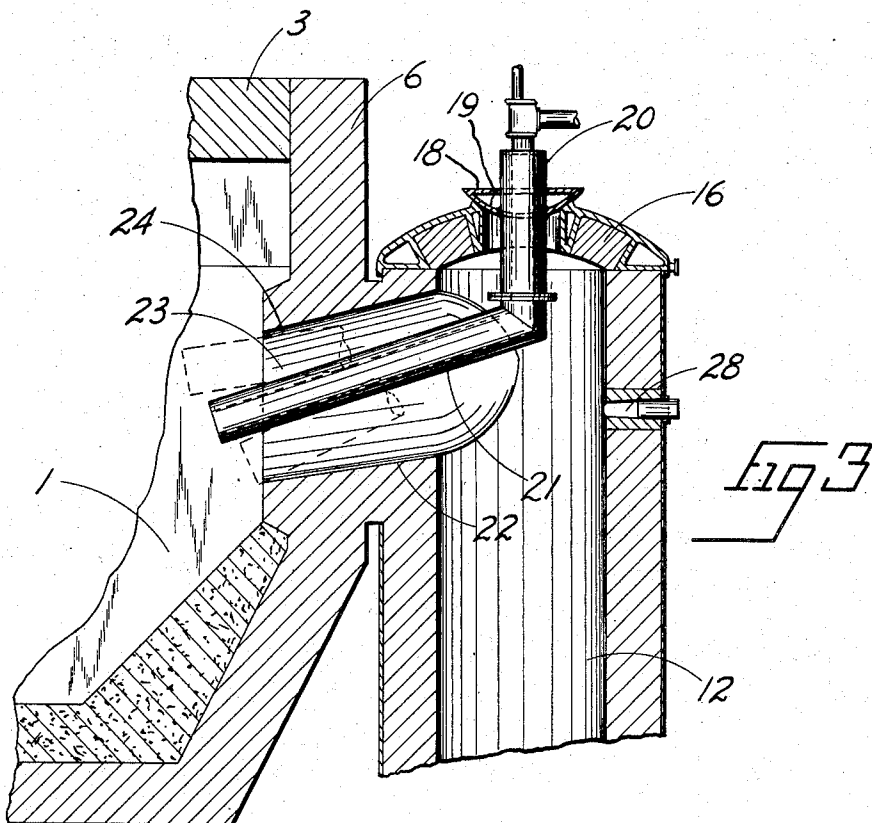
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END WALL CONSTRUCTION FOR OPEN HEARTH FURNACES

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2 Sheets-Sheet 2



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2,021,245

END WALL CONSTRUCTION FOR OPEN
HEARTH FURNACES

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Application February 11, 1933, Serial No. 656,208

2 Claims. (Cl. 263—15)

This invention relates to a new and improved type of open hearth furnace and more particularly to an end wall construction which would permit the continuous introduction of combustible materials into the furnace and the continuous efflux of waste gases therefrom.

In open hearth furnaces of the conventional type, the fuel, and air for its combustion, is introduced through suitable ports in one end of the furnace and the waste gases are caused to pass out of the other end of the furnace through similar ports. At predetermined intervals this operation is reversed and the waste gases are then caused to pass out of the furnace through ports by which the air, and in some cases the fuel, entered during the previous cycle. Due to the fact that the direction of draft is reversed in the conventional furnace the effluent gases erode the ports to the extent that the direction and velocity of the flame is gradually changed from that originally intended, thus rendering the flame less effective. Furthermore, since the flame travels only in one direction at a time, the draft must be forced to heat, effectually, the effluent end of the bath. Such practice does not permit the intimate mixture of fuel and air and the resulting necessary long flame often extends into the slag pockets and checkers of the regenerators.

It is, therefore, among the objects of this invention to provide a metallurgical furnace wherein the streams of fuel and air are rapidly and intimately mixed upon introduction into the furnace to provide a relatively short flame; a furnace having an end wall construction wherein a plurality of ports are provided for the continuous introduction of air and fuel into the furnace and flues for the continuous discharge of waste gases from the furnace. A still further object of my invention is to provide a port construction for continuously projecting air into the furnace in a fixed direction having associated therewith a burner whereby a stream of fuel may be directed in any desired direction within the air stream.

The illustrated embodiment of my invention discloses an end wall construction for open hearth furnaces wherein there is provided a central flue leading to the downtake through which the waste gases are conveyed from the furnace. Disposed on either side of this exit flue are fixed air ports through which the air and combustible material are continuously introduced into the furnace chamber simultaneously with the discharge of waste gases therefrom through the intermediate exit flue. These air ports are so disposed that the air is introduced into the furnace chamber from opposite sides of the exhaust flue at converging angles toward the central portion of the furnace chamber. Associated with the fixed air ports are adjustable fuel burners or tubes which project

the fuel into the furnace within the air stream. These fuel burners are adjustable within the confines of the port opening to maintain the flow of fuel within the stream of air projected into the furnace.

Various advantageous features of this invention will become more apparent to those skilled in the art as the detailed description thereof continues, considered in conjunction with the accompanying drawings wherein similar characters of reference designate corresponding parts and wherein:

Figure 1 is a fragmentary horizontal sectional view taken along the center line of the air ports disposed adjacent one end of an open hearth furnace embodying my invention;

Figure 2 is a fragmentary sectional view taken along the line 2—2 of Figure 1;

Figure 3 is a fragmentary sectional view taken along the line 3—3 of Figure 1 illustrating the relation of the fixed air port and adjustable fuel burner associated therewith with the wall of the furnace;

Figure 4 is a view similar to Figure 3 showing an alternative mounting of the adjustable fuel burner within the air port.

With reference to the drawings and particularly Figures 1 and 2 there is illustrated an end wall construction for an open hearth furnace embodying my invention wherein 1 designates the open hearth chamber having associated with the end thereof an exit flue 2 and a downtake 2a. Inasmuch as the construction of both ends of the furnace is identical, it is deemed only necessary to describe and illustrate one end. The downtake 2a is centrally disposed and offset longitudinally from the end of the furnace chamber. Walls 6 which may be of any suitable contour; those illustrated, being arcuate, are adapted to connect the ends of the side walls 7 and 8 of the open hearth furnace with the vertical side walls 9 and 10 respectively of the downtake 2a to provide the centrally disposed exit flue 2 for the waste gases. The upward extension of the wall 11 completes the flue connecting the furnace chamber with the downtake 2a. The furnace is provided with any conventional roof 3 which also covers the exit flue 2 and the downtake 2a. The flue 2 and downtake 2a are adapted to continuously convey waste gases from the furnace chamber to suitable regenerators or recuperators (not shown) as the case may be. These flues are not adapted to introduce air or fuel into the furnace and therefore any change in flue area due to the erosion or other causes does not affect the direction or control of the melting flame being introduced into the furnace.

Disposed adjacent the arcuate walls 6 exterior of the furnace are suitable vertical air ducts 12 which are adapted to convey preheated air from 60

any suitable source of supply (not shown) through air ducts 13, 14 and 15, ducts 13 connecting with the base of the vertical ducts 12. Apparatus for conveying heated air to the bases of the air ducts 12 is clearly illustrated in my co-pending application, Serial No. 629,249, filed August 17, 1932. The waste gases are preferably adapted to be discharged continuously from the furnace chamber through the exit flues and downtakes disposed at opposite ends of the furnace to a recuperator (not shown). In those cases where it is desirable to use a regenerator to preheat the air prior to its introduction into the furnace chamber a suitable valve or damper 30 (Figure 2) operating in a water cooled seat 31 is disposed within the downtake 2a to alternately discharge waste gases from the opposite ends of the furnace.

Referring now to Figure 3 the upper-most portion of the conduit 12 is provided with a suitable cap 16 having an axial or centrally disposed aperture 17. This aperture 17 is provided with a cover 18 secured to the water jacket of the fuel burner 20, the cover 18 having formed thereon a spherical surface 19 setting on a comparable surface provided on the cap 16. The fuel burner 20, itself, supported and mounted in cover 18 is permitted a universal movement relative to the air duct 12. The fuel burner 20 extends downwardly through the plate 18 into the air duct 12 and is provided with an angulated portion 21 which extends through an aperture 22 in the wall of the duct 12 and into the furnace chamber through port 23 formed in the wall 6. Port 23 may be circular or of other suitable contour and is preferably provided with an outward extension 24 projecting into the furnace as shown in Figure 2. As illustrated in the drawings the ports on opposite sides of a downtake project air into the furnace chamber in fixed directions converging toward the central portion of the furnace. The port 23 and the aperture 22 are continuous and so constructed as to prevent the leakage of air at this point. Through the construction of the cap 16 of the duct 12 the angulated portion 21 of the fuel burner is adjustable for flame direction within the confines of the port 23. Suitable peep holes 28 are provided in the vertical walls of the duct 12 for observing the direction of the flame.

The port 23 is adapted to continuously project a stream of air into the furnace chamber in a fixed direction while the fuel burner through which fuel is introduced into the air stream may be adjusted for the best mixture of air and fuel within the furnace and/or the accurate direction of flame from any firing port on to the furnace charge. Simultaneously with the introduction of fuel and air into the furnace through the ports 23 waste gases are conveyed from the furnace through the intermediate exit flue.

With reference to Figure 4 I have shown a modified form of fuel burner and mounting and the relation thereof with respect to the port 23 of the furnace. The wall of the conduit 12 diametrically opposite the aperture 22 is provided with a casting 25 which supports a ball joint 26 carrying a burner tube 27. Through the provision of the ball joint 26 the burner tube 27 is mounted for adjustment within the port 23 so that the fuel may be introduced into the furnace within the air stream flowing through the port 23 in

any desired direction. The fuel burner 21 shown in Figure 3 and the burners 27 shown in Figure 4 are preferably of the water cooled type. In those cases where liquid fuel is used the burners are provided with any suitable means for atomization such as by compressed air or steam as is commonly used. Where gaseous fuel is used the same is introduced under pressure into the furnace through a fuel tube of the water cooled type of burner.

Among the advantageous features of the invention herein described is that the combustible mixture enters the furnace continuously at a plurality of points rather than at a single point as common in the reversing furnace. The volume of combustible material and air entering at each point is materially reduced. The effect of this decreased volume operates to decrease the linear distance required for the admixture of air and fuel and the attendant complete combustion, thus producing the desired short quick flame. Furthermore, due to the fact that fuel and air are continuously entering the furnace through the air ports and the waste gases continuously conveyed from the furnace through exit flues, there is provided a furnace which is continuously fired. Furthermore, the ports through which the combustible mixture enters the furnace never serve as exit flues for waste gases. The erosion of fuel ports and the accompanying objectionable features where such ports are used as exit flues are eliminated.

Although the forgoing description is necessarily of a detailed character various modifications may be made by those skilled in the art without departing from the scope of the appended claims.

I claim:

1. In an open hearth furnace having a refining chamber of generally rectangular formation, an end wall construction therefor having a downtake exhaust port serving only as a passage for continuously conveying waste gases from the chamber, inlet ports for continuously introducing air into the furnace chamber simultaneously with the escape of waste gases through the exhaust port, said inlet ports being disposed on opposite sides of the exhaust port and arranged to continuously project a stream of air into the chamber in fixed directions converging toward the central portion of the furnace, means for continuously projecting a stream of fuel into the furnace chamber within each air stream and means for varying the angle of projection of the stream of fuel within said air streams.

2. In an open hearth furnace having a refining chamber of generally rectangular formation, an end wall construction therefor having a downtake exhaust port serving only as a passage for continuously conveying waste gases from the chamber, inlet ports for continuously introducing air into the furnace chamber simultaneously with the escape of waste gases through the exhaust port, said inlet ports being disposed on opposite sides of said exhaust ports and arranged to continuously project a stream of air into the furnace chamber in a fixed direction and means for continuously projecting streams of fuel from said inlet port into the furnace chamber in directions converging toward the central portion of the chamber.

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