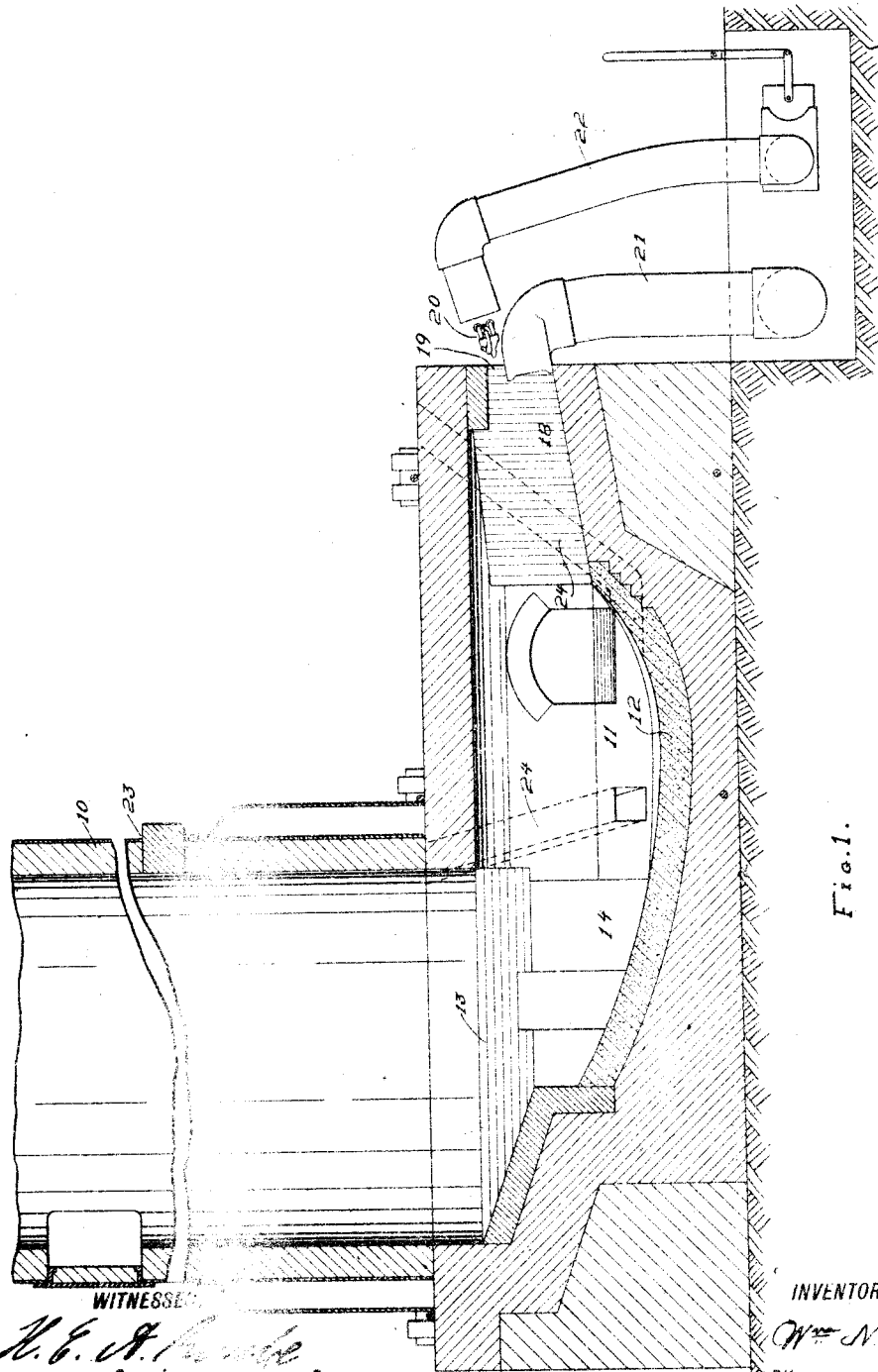


1,061,168.

W. N. BEST.
CUPOLA FURNACE.
APPLICATION FILED SEPT. 12, 1911.

Patented May 6, 1913.

3 SHEETS—SHEET 1.



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3 SHEETS-SHEET 2.

158.

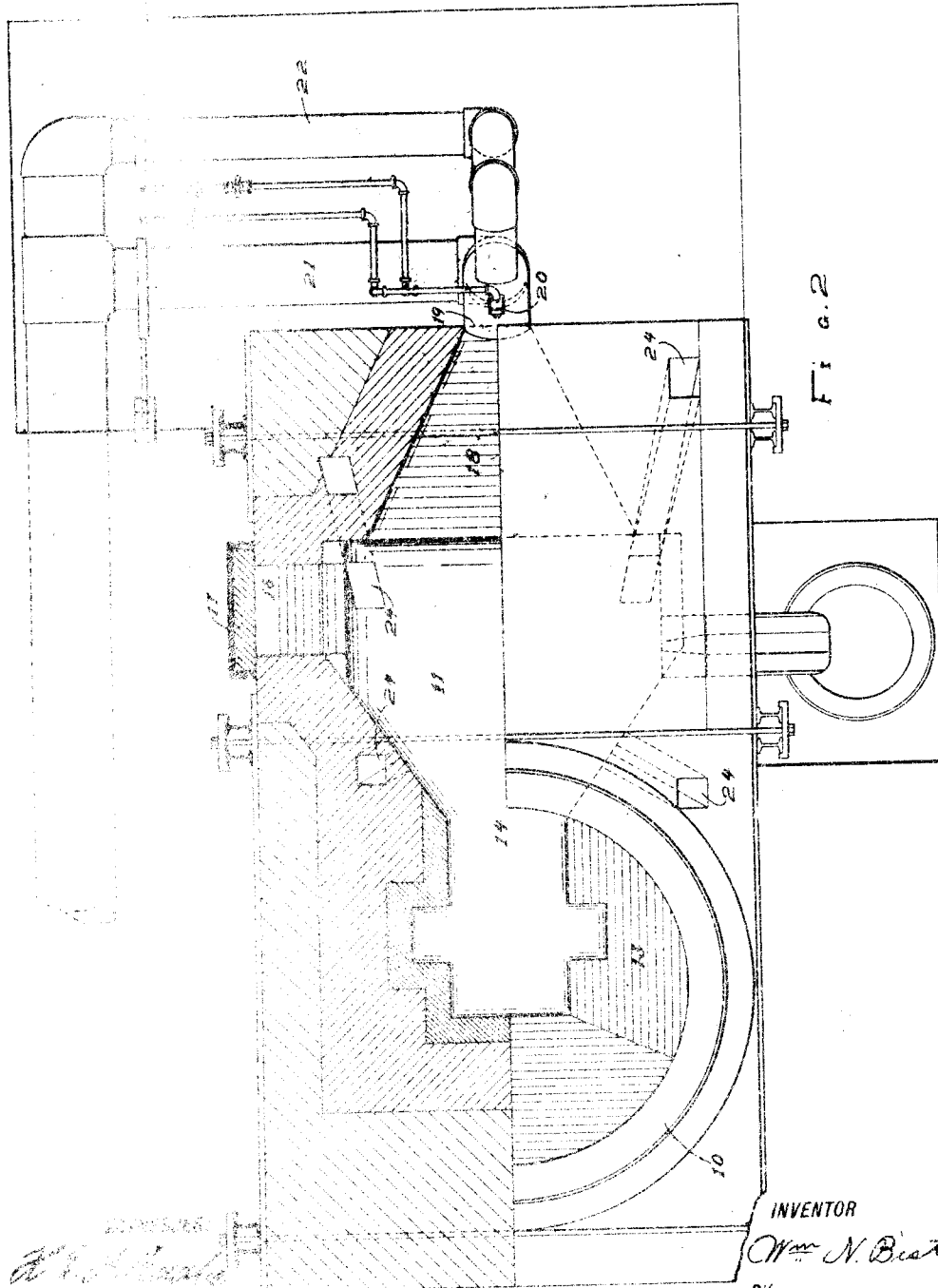


Fig. 2

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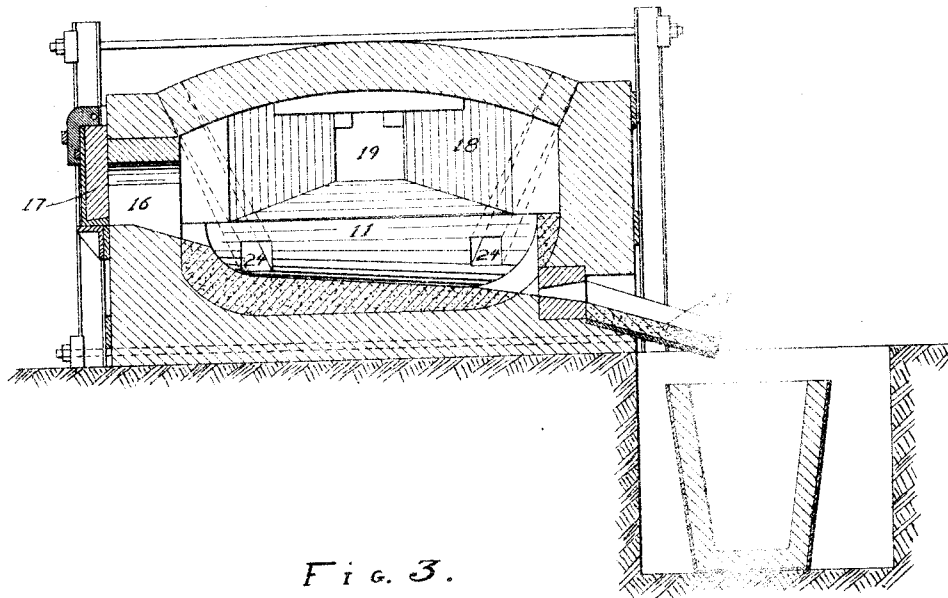
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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CUPOLA-FURNACE.

1,061,158.

Specification of Letters Patent.

Patented May 6, 1913.

Application filed September 12, 1911. Serial No. 648,958.

To all whom it may concern:

Be it known that I, WILLIAM NEWTON BEST, a citizen of the United States, and a resident of the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Cupola-Furnaces, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in cupola furnaces, and the object of the invention is to so construct the furnace that crude oil or any other liquid hydrocarbon can be used as the fuel instead of coal or coke as is employed in ordinary practice.

In the common type of cupola furnace, the body of the furnace is charged by first placing a quantity of wood in the bottom and then piling upon it alternate layers of fuel and metal, the former being ordinarily coal or coke and the latter being pig iron or scrap iron. The fire is then kindled in the wood at the bottom and an air blast from a positive blower is used to supply the oxygen necessary for the combustion of the entire fuel mass. As the metal melts, it passes through the fuel and of course absorbs much of the sulfur contained in the fuel, which is detrimental to the metal.

In my improved construction, I form the cupola in combination with a bath furnace and deliver the flame and the necessary air across the bath furnace and up through the cupola. This permits of the thorough mixing of the metal after it flows from the cupola into the bath furnace, and, as no coal or coke is used, difficulties arising from the presence of sulfur therein are entirely avoided.

The invention involves the arrangement and combination of parts hereinafter described in detail and particularly pointed out in the claim.

Reference is to be had to the accompanying drawings which form a part of this specification and in which similar reference characters indicate corresponding parts in the different views.

Figure 1 is a central vertical section through a furnace constructed in accordance with my invention; Fig. 2 is a top plan view, one-half being shown in section on the line 2-2 of Fig. 1; and Fig. 3 is a transverse section on the line 3-3 of Fig. 1.

In my improved construction, there is a

main stack or cupola 10 of any suitable construction and adapted to be charged at the upper end through any form of charging doors or other apparatus not shown. The cupola at its lower end rests upon a base, within which is formed a bath furnace 11. The cupola is lined with fire brick or other suitable refractory material, as are also the side and top walls of the bath furnace. The bottom of the latter is preferably provided with a layer of furnace sand 12. The cupola stands at one end of the bath furnace and has a restricted opening through which it may communicate with the bath furnace. The cupola has a floor 13 preferably of magnesite brick, the floor sloping downwardly to the opening 14, constituting the outlet of the furnace.

The bottom of the bath furnace is preferably curved and at one side is a tapping spout 15, through which the metal may be drawn off to a suitable ladle or other device. Opposite to the tapping spout is a doorway 16 normally closed by a door 17, with a refractory lining and a cast iron frame. At the end of the bath furnace opposite to the cupola is a combustion chamber 18 above the normal level of molten metal in the bath furnace. This combustion chamber is substantially triangular in horizontal cross section, its base being of the full width of the bath furnace closely adjacent the door 17 and the tapping spout 15, and its apex being at a slightly higher elevation and constituting the inlet 19. At this inlet there is placed a burner 20 preferably constructed as disclosed in my prior Patent No. 752,195 granted February 16, 1904. This burner serves to spray a fan-shaped sheet of liquid fuel downwardly through the combustion chamber, so that the flame will strike the metal in the bath furnace upon its upper surface and adjacent the outlet. Below the burner is a large air inlet pipe 21, delivering air under pressure into the combustion chamber below the burner, to supply the necessary air for carrying on the complete combustion of the liquid fuel. The air or steam delivered through the burner serves primarily to atomize and distribute the fuel throughout the combustion chamber, while the pipe 21 serves for the delivery of the air supporting the combustion. A second air pipe 22 may be employed, if desired, and delivered directly in the rear of the burner. This is used only to

increase the velocity of the flame through the charge in the cupola.

In charging my improved furnace, a few pieces of wood are placed in position across the bottom of the cupola, so as to protect the refractory material in the neck of the furnace and to complete the bottom of the cupola. This wood may be inserted in any suitable manner, but for convenience an opening 23 may be employed in the side of the cupola and this may later be bricked up. The cupola is then filled with iron, no coke being used. The burner 20 is started and while the furnace is being brought to the desired heat, the bottom of the furnace is being prepared to receive the molten metal, by being heated to a degree which will not chill the metal but which will, on the other hand, increase its temperature. The flame passes from the combustion chamber through the bath furnace to the opening 14 and thence upwardly through the cupola. The iron melts and begins to run down through the opening 14 and collect in the bath furnace. If it is desired to simply run cast iron, the metal can pass directly into a ladle without filling the bath furnace. If dense iron is to be made, the pig and the steel which is added thereto can flow into the bath furnace until two or three tons of it has accumulated, and the mass can be thoroughly mixed by poling in the usual manner.

The burner is of such character that it delivers a fan-shaped flame of substantially the same shape as the combustion chamber and the walls of the bath furnace opposite to the combustion chamber converge toward the opening 14 so that the flame is brought together and delivered with full effect through the opening 14 into the lower portion of the charge. Either compressed air or steam can be used in the burner to atomize the fuel, and the burner may be regulated to produce the oxidizing or reducing flame and to produce any desired degree of heat. As an added feature, I provide means whereby turnings or borings from castings

may be charged in the bath furnace so as to eliminate the oxidation of the small particles of metal. For this purpose I have illustrated four tubes or conduits, (24) leading from the upper surface of the bath furnace to outlets beneath the normal level of the metal in the bath furnace. Through these tubes or conduits, the borings or turnings may be delivered directly into the molten metal and united with the latter without liability of oxidation.

By having the bath as above described, the metal may be run directly into the ladles or may be held and steel added to the bath. Manganese or other materials may also be added to the bath and stirred into the mixture. In this manner, various kinds of metals may be made from one charge. The oxygen unites with the fuel in the combustion chamber before it reaches the bath of the furnace. This prevents the oxidation of the metal, whereas in the ordinary cupola, there is a very considerable oxidation. Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

In combination, a cupola furnace having a substantially closed chamber in open communication therewith and into which the molten metal may flow, a combustion chamber at the end of said metal-receiving chamber opposite to said cupola and flaring inwardly and downwardly to substantially the full width of said first-mentioned chamber and to the upper surface of the normal metal level in the latter, means at the outer end or apex of said combustion chamber for spraying the liquid fuel into said combustion chamber, and a separate conduit delivering combustion-supporting air to said chamber below said spraying means.

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

WILLIAM NEWTON BEST.

Witnesses:

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C. W. FAIRBANK.