

No. 740,360.

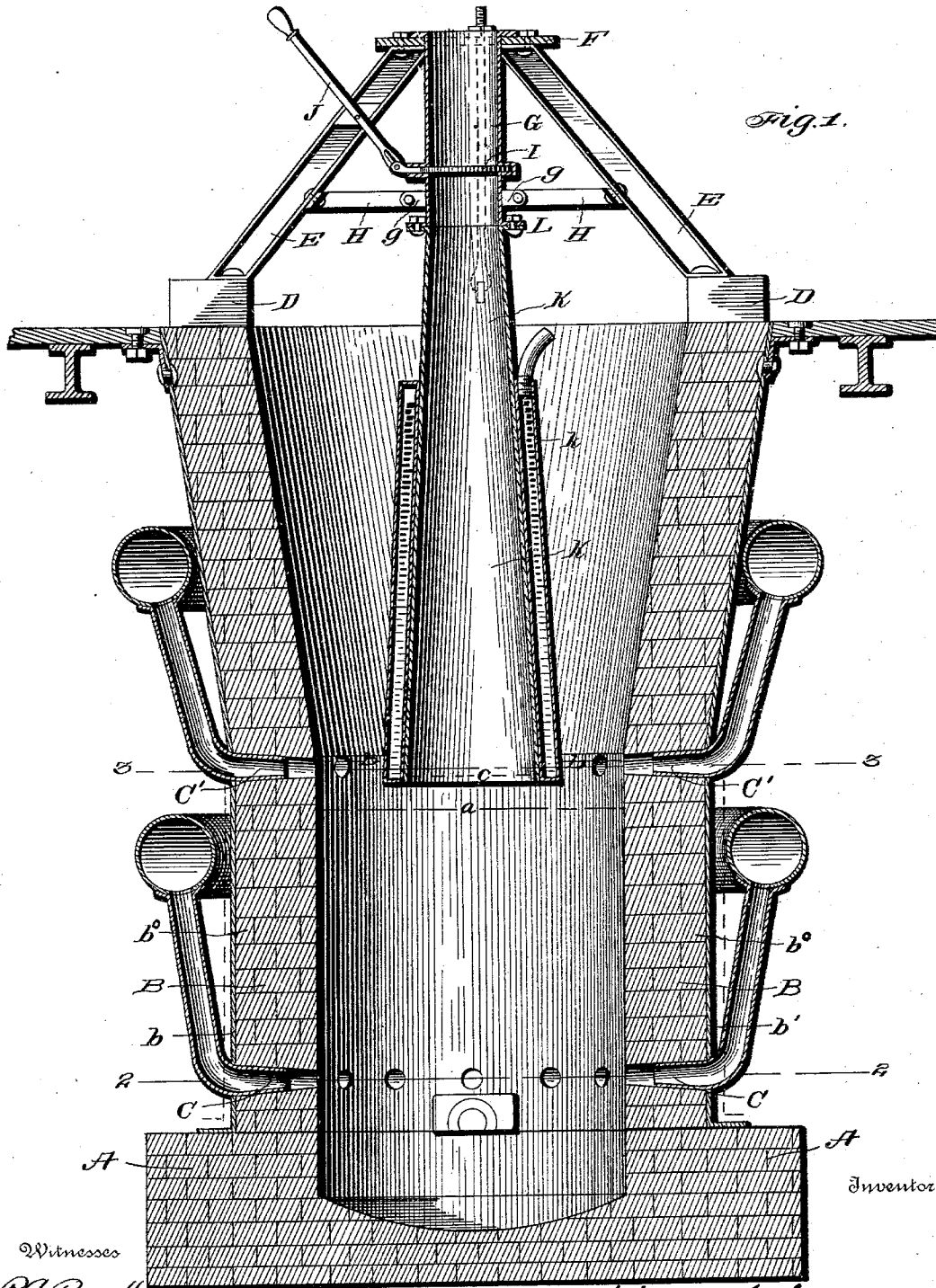
PATENTED SEPT. 29, 1903.

W. F. HANNES.
METALLURGICAL FURNACE.

APPLICATION FILED OCT. 28, 1902.

NO MODEL.

2 SHEETS--SHEET 1.



Inventor

Witnesses

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William F. Hannes,
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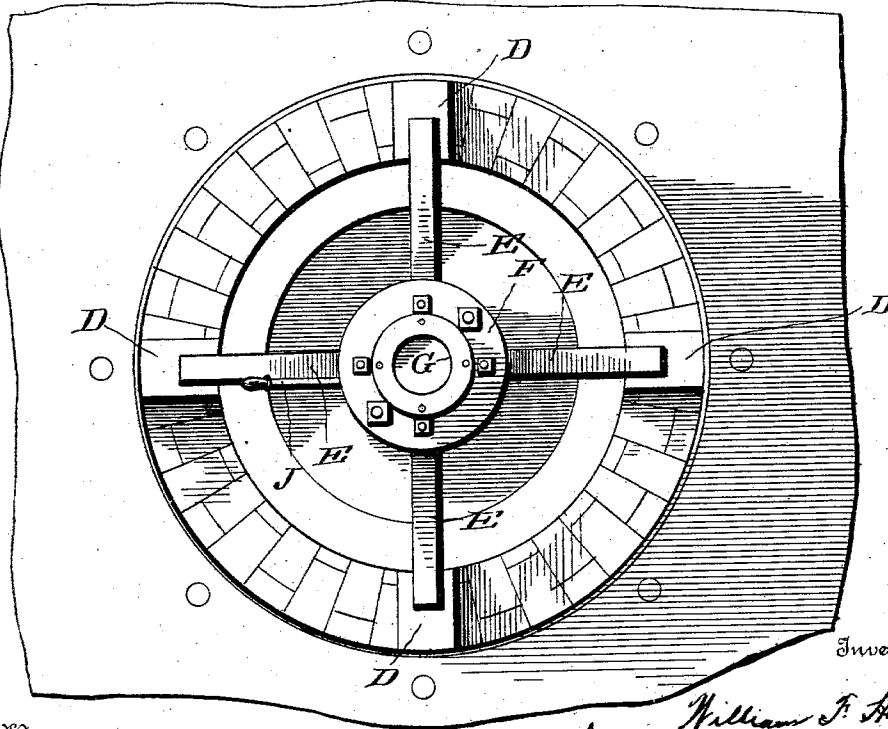
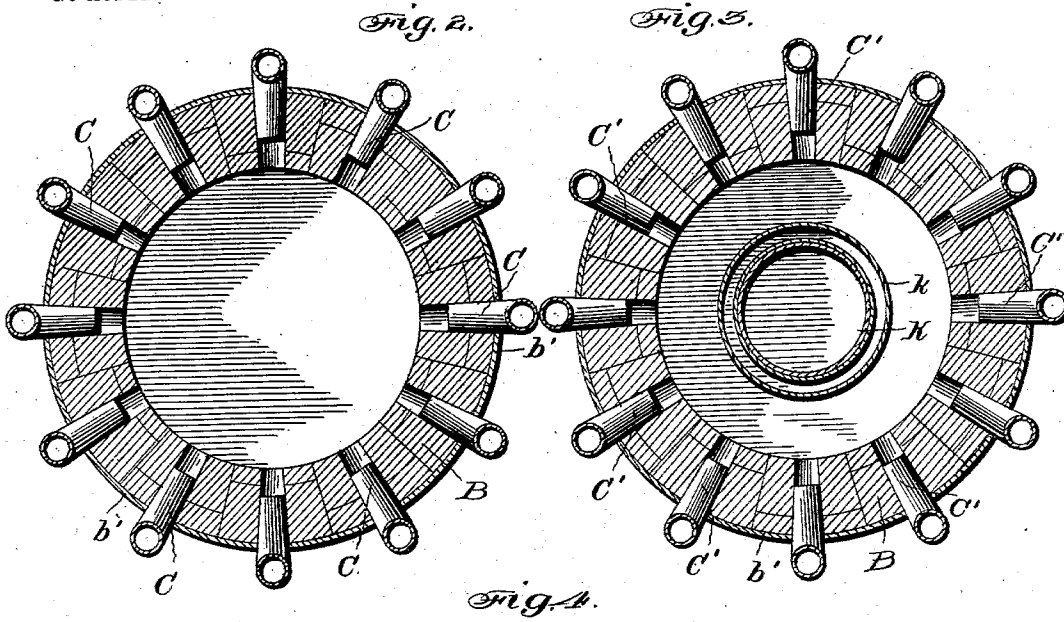
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UNITED STATES PATENT OFFICE.

WILLIAM FREDERICK HANNES, OF DEMING, TERRITORY OF NEW MEXICO,
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DEL ORO, MEXICO.

METALLURGICAL FURNACE.

SPECIFICATION forming part of Letters Patent No. 740,360, dated September 29, 1903.

Application filed October 28, 1902. Serial No. 129,114. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM FREDERICK HANNES, a citizen of the United States, residing at Deming, in the county of Luna and Territory of New Mexico, have invented certain new and useful Improvements in Metallurgical Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has for its object certain improvements in metallurgical furnaces whereby the operation of smelting is simplified to a great extent, resulting in a consequent reduction of time and labor ordinarily consumed in reducing ores.

It is also the object of my said invention to increase the efficiency and capacity of such furnaces.

It is the general practice in reducing ores to give to the ore a preliminary roasting before reduction in the blast-furnace, such operation being generally conducted in a reverberatory or other specially-provided furnace. Such a procedure not only necessitates additional time and expense in the reduction of metal, but results in considerable loss due to causes such as the escape of unconsumed combustible gases, heat radiation, and other causes invariably arising from complex and long-drawn-out processes.

These and other disadvantages and objectionable features it is the object of this invention to eliminate, and in order that the same may be more fully understood reference will be had to the accompanying drawings, illustrating a furnace embodying my said improvements.

In the views, Figure 1 is a sectional elevation of a furnace embodying my said improvements. Fig. 2 is a transverse sectional view of the same upon the line 2 2, Fig. 1. Fig. 3 is a similar view taken upon the line 3 3, Fig. 1, and Fig. 4 is a plan view of the furnace.

Although a rectangular, octagonal, or other desired cross-section may be adopted for the furnace, a circular cross-section is the preferred form, such a furnace being illustrated in the drawings. In this furnace, as illustrated, A represents a base, preferably of some

suitable refractory material, as cupola-blocks, fire-clay brick, or the like. This bottom may be so constructed as to allow the same to be lowered in discharging the furnace and when in position constitutes the lower portion of the furnace-hearth. Resting upon this base A is the vertical shaft B, constituting the furnace-body. This furnace may be constructed of the usual materials, such as a lining of fire-brick or other refractory material b^0 , inclosed within a boiler-iron casing or shell b' , and, if desired, a water-jacket may be applied to the bosh of the furnace; but instead of constructing this furnace in accordance with the dimensions and proportions generally adopted an essential departure is made, the purpose of which will hereinafter more fully appear. At the lower portion of this shaft are provided the usual radially-disposed reducing-twyers C C, and directly above these reducing-twyers at a predetermined height are the similarly-disposed oxidizing-twyers C' C', the inner walls of the furnace between these reducing and oxidizing twyers being of uniform diameter and cross-section. Beginning at the oxidizing-twyers, however, the diameter of the furnace rapidly increases until the top of the furnace is reached, giving a hopper shape to the furnace from the oxidizing-twyers to the top of the furnace.

Resting upon the top of the furnace-wall are suitable supports D, supporting the lower ends of the arched beams E. The upper ends of these beams E converge toward the center of the furnace and support the top plate F. Attached to this plate F is a cylindrical chute G, provided with lugs g . Between these lugs g and the centers of the beams E are interposed braces H. The cylindrical chute G is provided with a sliding gate I, operated by the lever J, pivoted to one of the beams E or any other stationary part of the furnace. Immediately beneath this cylindrical chute G is a hollow casing K, having a cross-section at its upper end equal to the cross-section of the chute G, but gradually increasing in cross-sectional area as the bottom thereof is approached. This casing extends from the bottom of the chute G down to a point slightly below the oxidizing-twyers C, a suitable socket or union L being inter-

posed between the upper end of the casing K and the bottom of the chute G. Suitable means may be employed for removably supporting this casing against the cylinder G, a plurality of threaded rods being illustrated for this purpose interposed between the casing K and the top plate F. This casing K may be lined with a suitable refractory material or may be provided with a water-jacket k, as shown in the drawings.

In practice it has been found desirable to proportion the opening in the discharge end of the casing K relatively to the cross-sectional area of the annular space between the outside of the casing K and the inner wall of furnace, thereby regulating the supply of fuel and ore to the furnace in predetermined quantities. Thus in a furnace having a diameter of six feet at the point *a* the lower end of the casing K at the point *b* is spaced at a distance of fifteen inches from the wall of the furnace and the opening at the point *c* has a diameter of thirty-four inches.

The operation of the furnace is as follows:
 The furnace above the oxidizing-twyers C' C' being supplied with ore from a chute or other suitable source of supply and fuel supplied from any well-known means to the casing K through the chute G, controlled by the gate I, the furnace may be started in the usual manner. As the ore is fed to the furnace around the walls of the furnace and the fuel is fed separately through the casing K the ore and fuel will not meet until they reach a point slightly below the oxidizing-twyers C' C'. After passing this point the ore will descend in an annular film or layer against the wall of the furnace, while the fuel will occupy the center thereof. As the fuel is thus separated from the walls of the furnace by the interposition of the ore, protection will be afforded the furnace-walls against burning, and at the same time rapid radiation of heat is prevented, materially increasing the efficiency of the furnace. As the ore passes the discharge end of the casing K the same is brought into contact with the incandescent fuel within the zone of the reducing-twyers, when reduction immediately begins.

In ores containing sulfur the temperature of combustion of the sulfur is 3,575° Fahrenheit, and as the temperature of combustion of carbon is 4,877° (thirteen hundred degrees greater) the sulfur will be liberated and burned from the partially-roasted ore in the upper portion of the furnace, the temperature of the ore increasing as it descends into the furnace until the partially-smelted ore is brought to the zone of fuel combustion, when the reduction is completed. This roasting or oxidizing action upon the ore is produced in the following manner: The gases, in combination with carbon monoxid liberated from the partially-consumed fuel, will pass around the bottom of the fuel-casing K; but instead of passing off from the furnace as waste gases oxygen is supplied to said gases from the oxi-

dizing-twyers C' C', causing a combustion of said gases to result. These heated gases in passing through the ore being fed to the furnace above the oxidizing-twyers produce an oxidation of the ore. Thus it will be seen that while the smelting is progressing at the lower portion of the furnace the gases evolved therefrom are utilized in producing an oxidizing action upon the ore preliminary to the smelting action, combining in one furnace operations hitherto constituting two separate and entirely distinct operations.

In forming the upper portion of the furnace with a gradually-widening diameter the passage of the heated gases through the ore is delayed, thereby allowing the maximum amount of heat to be given the ore before the escape of the gases. Any suitable means may be employed, such as a bell and hopper, for feeding the fuel to the chute G, and normally the gate I will be closed to prevent the passage of the heated gases through the fuel in being fed to the furnace.

The operation of the furnace is continuous, ore being charged at intervals and in predetermined quantities in proportion to the fuel, such proportion being determined by the quality of ore under treatment, the smelting-twyers operating continuously with the oxidizing-twyers.

While I have shown my invention in but one embodiment, it will of course be understood that I do not so limit myself, as many changes and modifications might suggest themselves to those skilled in the art, which changes and modifications could be made without departing from the spirit of my said invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a metallurgical furnace, a lower chamber having twyers at the lower portion, an upper chamber merging into the lower chamber and decreasing in area from the upper end, twyers located at said merging portion for supplying an oxidizing-blast, a fuel-casing located in the furnace with its discharge end located slightly below the zone of the oxidizing-twyers, substantially as described.

2. In a metallurgical furnace, a lower chamber having twyers at the lower portion, an upper chamber merging into the lower chamber and decreasing in area from the upper end, twyers located at said merging portion for supplying an oxidizing-blast, a fuel-casing of increasing area from its upper end located in the chamber with its lower end slightly below the zone of the said oxidizing-twyers, substantially as described.

3. In a metallurgical furnace, a lower chamber having twyers at the lower portion, an upper chamber merging into the lower chamber and decreasing in area from the upper end, twyers located at said merging portion for supplying an oxidizing-blast, a fuel-casing located in the furnace with its discharge end

located slightly below the zone of the oxidizing-twyers, and means for removably supporting the fuel-casing in the furnace, substantially as described.

5 4. In a metallurgical furnace, a lower chamber having twyers at the lower portion, an upper chamber merging into the lower chamber and decreasing in area from the upper end, twyers located at said merging portion for
10 supplying an oxidizing-blast, a fuel-casing located in the furnace with its discharge end located slightly below the zone of the oxidizing-twyers, a collar secured to the upper part
15 of the casing, and a series of beams converging from the top of the upper casing to said collar and thereby supporting the casing, substantially as described.

5. In a metallurgical furnace, a lower cham-

ber having twyers at the lower portion, an upper chamber merging into the lower chamber 20 and decreasing in area from the upper end, twyers located at said merging portion for supplying an oxidizing-blast, a collar, a series of beams converging from the top of the furnace and secured to said collar, a cylinder de- 25 pending from said collar and having a flange on its lower end, and a fuel-casing having a flange on its upper end and thereby movably attached to said flange on the cylinder, substantially as described.

30 In testimony whereof I affix my signature in the presence of two subscribing witnesses.

WILLIAM FREDERICK HANNES.

Witnesses:

MARIE BECKENSTEIN,

WILLIAM B. RODDA.