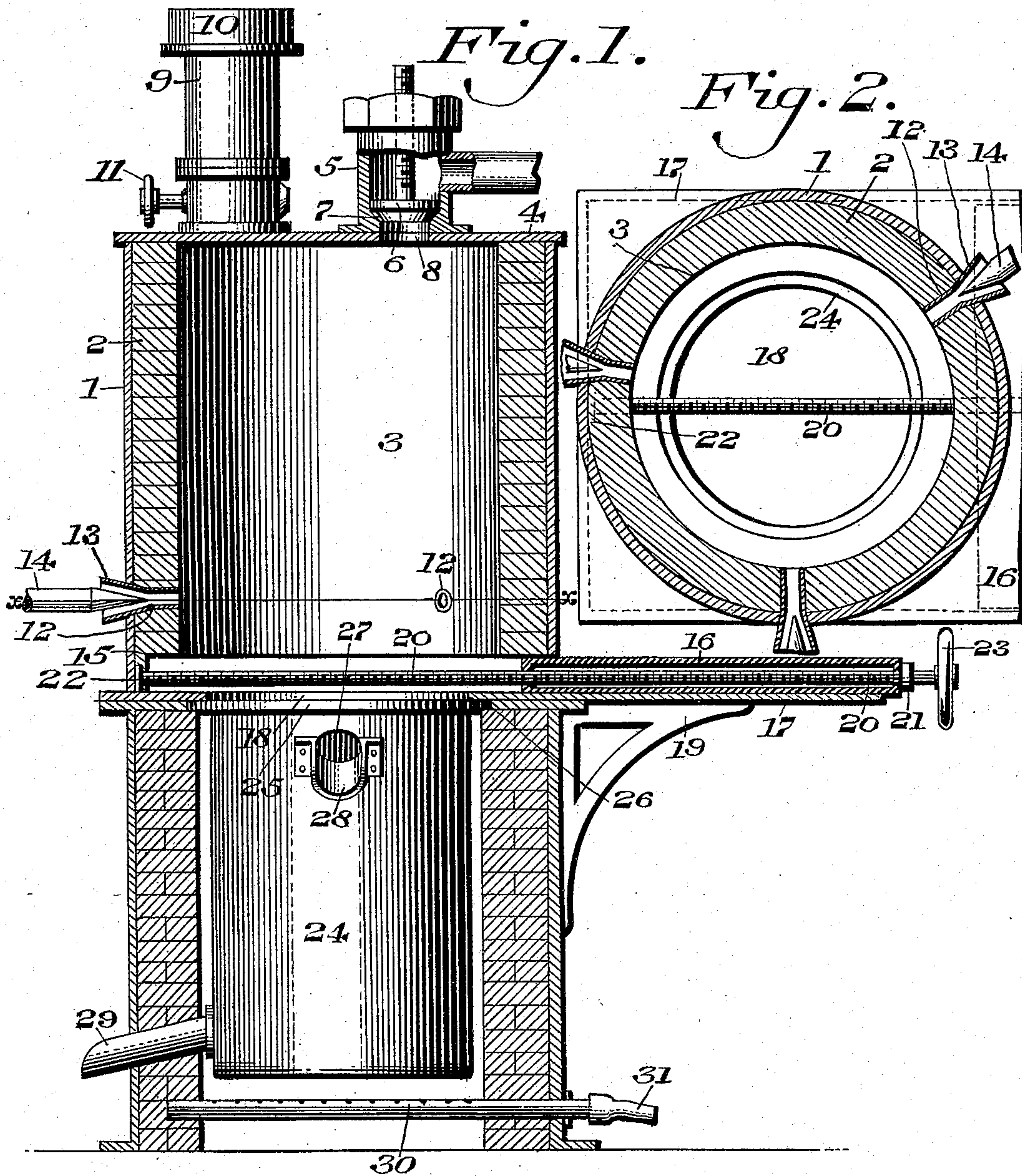


G. F. RENDALL.
FURNACE.

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930,492.

Patented Aug. 10, 1909.



Witnesses

P. F. Nagle.
L. D. Duville.

Inventor
George Frederick Rendall.

By Riedersheim & Fairbanks,
Attorneys

UNITED STATES PATENT OFFICE.

GEORGE FREDERICK RENDALL, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN REDUCTION COMPANY, A CORPORATION OF NEW JERSEY.

FURNACE.

No. 930,492.

Specification of Letters Patent.

Patented Aug. 10, 1909.

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To all whom it may concern:

Be it known that I, GEORGE FREDERICK RENDALL, a subject of Great Britain, residing in the city and county of New York, State of New York, have invented a new and useful Furnace, of which the following is a specification.

The object of my present invention is to construct a furnace for the reduction of ores and more particularly such ores as part from their compounds only at very high heat.

To the above ends my invention consists broadly, of a novel construction of a furnace provided with two chambers, in the upper one of which means for the injection of petroleum is provided, which when heated causes a decomposition and recombination of the hydro-carbon gases to occur, and thus creates an intense heat. This action enables me to eliminate all the oxygen from the metals after which said metals are automatically discharged into a lower vessel or crucible and melted at the ordinary heat at which such metal can be reduced.

My invention further consists of a novel construction and arrangement of a relief valve which prevents any liability of the exterior walls of the furnace being damaged from the explosion which occurs as the gaseous material is injected.

It further consists of a novel construction of charging mechanism by means of which I am enabled to charge the furnace without admitting any external atmosphere except such as is contained in the ore itself.

It further consists of a novel construction of a slide or valve operating between the two chambers whereby I am enabled to readily discharge the metal from which the oxygen has been eliminated from the upper chamber of the furnace into the lower chamber thereof without the admission of atmospheric air.

It further consists of a novel construction of furnace comprising a plurality of chambers in which one of the chambers is internally heated and the other chamber thereof externally heated.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention I have shown one embodiment which best illustrates the principle thereof,

although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and while I have preferred to show an embodiment thereof which has been found to give satisfactory and reliable results in practice, my invention is not limited to the precise arrangement and organization of these instrumentalities, as herein shown.

Figure 1 represents a sectional view of a furnace embodying my invention. Fig. 2 represents a sectional view on line $x-x$, Fig. 1.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, 1 designates an outer casing which is provided with an inner lining 2 forming in the upper portion thereof a chamber 3 which is closed at its upper end by means of a cover 4 to which is attached the casing 5 of a relief valve 6 which engages a seat 7 in said casing and controls the port or passage 8 communicating with the internal chamber 3.

9 designates a feed hopper or conduit communicating with the chamber 3 and provided with a cover 10 and a valve 11.

12 designates an aperture extending angularly through the casing 1 and lining member 2 and having a funnel 13 into which the injector tube 14 discharges, said injector tube being directly connected with any desired means such as a force pump, not shown, whereby I am enabled to inject suitable gaseous material into the upper chamber 3 of the furnace. In the present instance I have shown a plurality of injectors being employed and the number employed varies according to the size of the furnace.

15 designates a recess or chamber in the lining member 2 at or near the bottom of the chamber 3 with which a preferably hollow slide or valve 16 is adapted to engage, said slide or valve being mounted on a guide 17 which is apertured at 18, and partly supported by means of a bracket 19 secured thereto and to the outer casing 1.

20 designates a feed screw passing through the hollow slide or valve member 16 and having threaded engagement therewith at 21, the inner end of said feed screw being swiveled at 22 and the outer end thereof being provided with a suitable actuating handle 23.

24 designates a crucible, bowl or vessel into which the metal is discharged after the oxygen contained therein has been eliminated. This crucible or vessel 24 is provided at its upper end with a flange 25 which is adapted to be seated in a recess 26 formed in the lining material 2, the aperture at the upper end of the bowl 24 being also controlled by the slide or valve 16. The crucible or vessel 24 is provided with a slag hole 27 in proximity to which a funnel or spout 28 is secured.

29 designates a tap hole at the lower end of the melting vessel 24.

30 designates an external source of heat such as a burner which is connected by means of a conduit 31 with the fuel supply, in case a gaseous fluid is employed.

The operation of the furnace may now be readily understood and is as follows:—The ore in a suitable condition is placed in the hopper 9, the furnace is then internally heated, oil for that purpose being forced in through the injectors 14 and creating at times a small explosion. Owing to the provision of the relief valve 6 and its adjuncts any danger that might arise from these explosions is counteracted so that there is no liability at any time of the furnace being injured from such explosion. The disassociation of the hydro-carbon compounds injected into the furnace gases causes an intense heat sufficiently strong to eliminate any oxygen and creates in addition a very strong reducing atmosphere. By this means all oxygen is eliminated and oxygen cannot recombine since all the atmosphere is excluded. As soon as the metal is reduced to a metallic form the slide or valve 16 is opened by actuating the handle 23 provided therefor and the material descends into the crucible or melting vessel 24. If desired a suitable flux can be added and the material tapped from the tap hole 29 and the slag hole 27 in the usual manner. Owing to the provision of the external source of heat 30 the melting vessel or crucible 24 may be heated to any desired degree.

It will now be apparent to those skilled in

this art that I have produced a novel and useful construction of a furnace which embodies the features of advantage enumerated as desirable in the statement of invention and the above description and while I have shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that it is susceptible of modification in various particulars without departing from the spirit and scope of my invention or sacrificing any of its advantages.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a furnace having a closed chamber and a vessel thereunder to receive the metal, means for injecting gas into said closed chamber, a relief valve for said chamber, means for internally charging said chamber without the admission of air, a valve controlling the passage of material from said closed chamber to said vessel, means for extracting the metal from said vessel, and means for externally heating said vessel.

2. In a furnace having a closed chamber and a vessel thereunder to receive the metal, means for injecting gas into said chamber, a relief valve for said chamber, a hollow valve controlling the discharge into said vessel and for supporting the ore in said chamber, means for extracting the metal from said vessel, and an external source of heat for said vessel.

3. In a furnace having a closed chamber and a vessel thereunder to receive the metal, means for injecting gas into said chamber, a relief valve for said chamber, an apertured guide between said chamber and vessel, a valve engaging said guide, actuating means for said valve, means for extracting the metal from said vessel, and a source of heat for said vessel.

GEORGE FREDERICK RENDALL.

Witnesses:

HERBERT S. FAIRBANKS,
C. D. McVAY.