

No. 774,591.

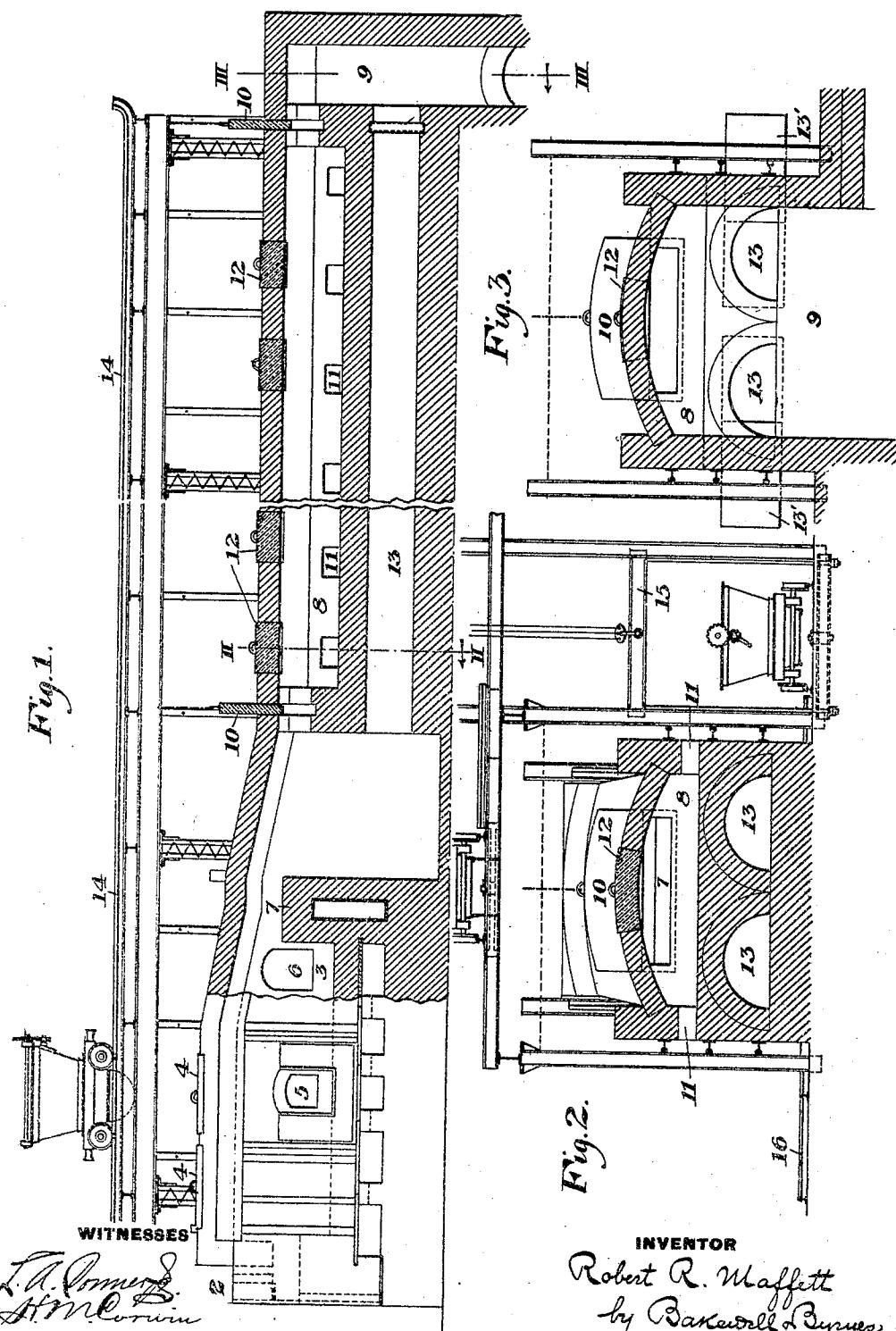
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R. R. MAFFETT,

FURNACE FOR REDUCING AND SMELTING NICKEL OXIDS.

APPLICATION FILED JAN. 29, 1903.

NO MODEL.



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## UNITED STATES PATENT OFFICE.

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## FURNACE FOR REDUCING AND SMELTING NICKEL OXIDS.

SPECIFICATION forming part of Letters Patent No. 774,591, dated November 8, 1904.

Application filed January 29, 1903. Serial No. 141,006. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT R. MAFFETT, of Bayonne, in the county of Hudson and State of New Jersey, have invented a new and useful Furnace for Reducing and Smelting Nickel Oxids, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

10. Figure 1 is a vertical sectional view of a furnace embodying my invention. Figs. 2 and 3 are vertical sections on the lines II II and III III, respectively.

The furnace which is the subject of my invention is designed for the reduction and smelting of nickel oxid by subjecting the oxid to the following successive steps: first, roasting of the oxid in admixture with carbon, by which the oxid is reduced partially to metal, 20 and, second, smelting the oxid and metal on the hearth of a smelting-chamber, by which the reduction is completed and the oxid reduced to metallic nickel which can be withdrawn from the smelting-chamber and cast 25 into molds. My invention enables both of these operations to be carried on in a single furnace with a very great saving of fuel and labor and a corresponding lessening of the cost of the finished product.

30. As shown in the drawings, heat is supplied to the furnace by burners 2 2, adapted to burn oil; but gas burners or flues discharging burning gases into the furnace from a combustion-chamber may be substituted, if desired.

35. 3 is the smelting-chamber, into which the flame from the burners enters directly. Its hearth is of suitable area to receive the charge of oxid to be smelted, and it is provided with 40 openings 4 4, preferably in the roof, for the introduction of the charge, with a tap-hole 5 for the withdrawal of the fused nickel and with suitable working doors 6 6.

45. At the rear end of the smelting-chamber and beyond the bridge-wall 7 is a muffle or reducing chamber 8, which is a long chamber communicating at its front end over the bridge-wall 7 with the smelting-chamber and communicating at its rear end with the stack-flue

9. Tile-dampers 10 are provided, preferably, 50 at both ends, by which the chamber may when desired be cut off from the stack-flue and the smelting-chamber. Working doors 11 are formed at its sides, and charging-doors 12 are provided, preferably, in the roof, 55 though, if desired, the charge to be reduced may be introduced through the side working doors.

Below the reducing-chamber are flues 13 13, one or more in number, which at the front 60 end communicate with the smelting-chamber over the bridge-wall and at the rear end discharge into the stack-flue. It will thus be seen that the flame and products of combustion from the smelting-chamber after passing 65 the bridge-wall are divided, part passing through the reducing-chamber and part passing through the flues beneath the reducing-chamber, and that by adjustment of the dampers 10, or either of them, any desired proportion 70 of the gases can be diverted through the flues or by shutting the dampers, or either of them, all of the gases may be caused to pass through said flues.

To charge the reducing-chamber with the 75 mixture of oxid and carbon which is to be spread over the floor of the chamber, I prefer to employ an elevated track 14, extending along and above the reducing-chamber and extending also above the smelting-chamber 80 for the charging of the latter. An elevator 15 may be used for raising the charging-cars to the elevated track, and tracks 16 extend along the reducing-chamber at the ground-level for the cars, into which the reduced 85 charge may be withdrawn when ready to be charged into the smelting-chamber.

In the operation of the furnaces a mixture of nickel oxid and ground charcoal, preferably in the proportion of nine parts, in weight, 90 of nickel oxid to one part of charcoal, is charged into the reducing-chamber and spread over the bottom thereof. In order to exclude the chamber from communication with the stack-flue, and thus prevent all drafts which 95 would tend to carry off part of the charge, the dampers 10 10 are closed during the time of charging. When the reducing-chamber

has been thus charged, the dampers are opened, and the flame from the burners heats the charge in the smelting-chamber, then passes through and under the reducing-chamber, heating the charge therein to incandescence, until, finally—say, at the end of five hours for a six-ton charge—the oxid has been sufficiently reduced, care being taken by adjustment of the dampers to prevent the heat in the reducing-chamber from becoming so high as to melt the charge. When the desired extent of reduction has been effected, the dampers 10 10 are again closed, so as to exclude the reducing-chamber from the draft of the stack, and the reduced charge, if not needed immediately for the smelting-chamber, is heaped at the end of the reducing-chamber, where it is kept hot until needed; but when needed for the smelting-chamber it is withdrawn through the working doors 11 into the cars on the tracks 16 beside the furnace. These cars are drawn to the elevator 15, hoisted to the elevated track 14, drawn to the smelting-furnace 2, and their contents dropped thereinto through the openings normally closed by the doors 4. A new charge of mixed oxid and carbon is then charged into the reducing-furnace and spread over the floor, the dampers 10 10 meanwhile being closed, as stated above. The charge for the smelting-chamber is preferably added in two or more lots because of the lessening of its bulk which occurs as it melts down. Thus ten thousand pounds of the partly-reduced oxid, with its admixed carbon, may be first charged. At the end of three hours three thousand pounds more may be introduced, and after five to seven hours thereafter the whole charge, being melted and reduced to metallic state, can be tapped into molds. During the smelting operation the waste heat from the smelting-chamber passes, as before stated, through the flues 13 and through the reducing-chamber and raises the mixture of oxid and carbon to incandescence, so that the operations in both the smelting-chamber and the reducing-chamber are carried on simultaneously, at the end of each heat the smelted charge be-

ing tapped from the smelting-chamber and a reduced charge transferred to the smelting-chamber, new charges of oxid and carbon being fed to the reducing-chamber from time to time. In this way I am enabled without the use of extra fuel to carry on the reduction of the oxid by the waste heat from the smelting operation. The economy of fuel, the compactness of furnace structure, and the lessening of labor which thus result effect a very great saving in the cost of finished product.

Within the scope of my invention as defined in the claims the furnace may be modified, since

What I claim is—

1. A furnace having an open-hearth smelting-chamber, an elongated reducing-chamber leading therefrom, charging-openings for said reducing-chamber arranged lengthwise thereof, a flue extending beneath the reducing-chamber, and a stack-flue with which the reducing-chamber and flue communicate at their rear ends; substantially as described. 65

2. A furnace having an open-hearth smelting-chamber, an elongated reducing-chamber leading therefrom, charging-openings for said reducing-chamber arranged lengthwise thereof, a flue extending beneath the reducing-chamber, a stack-flue with which the reducing-chamber and flue communicate at their rear ends, and a damper for the reducing-chamber; substantially as described. 75 80

3. A furnace having an open-hearth smelting-chamber, an elongated reducing-chamber leading therefrom, charging-openings for said reducing-chamber arranged lengthwise thereof, a flue extending beneath the reducing-chamber, a stack-flue with which the reducing-chamber and flue communicate at their rear ends, and a damper at each end of the reducing-chamber; substantially as described. 85 90

In testimony whereof I have hereunto set my hand.

ROBERT R. MAFFETT.

Witnesses:

AMBROSE MONELL,  
B. B. GATTELL.