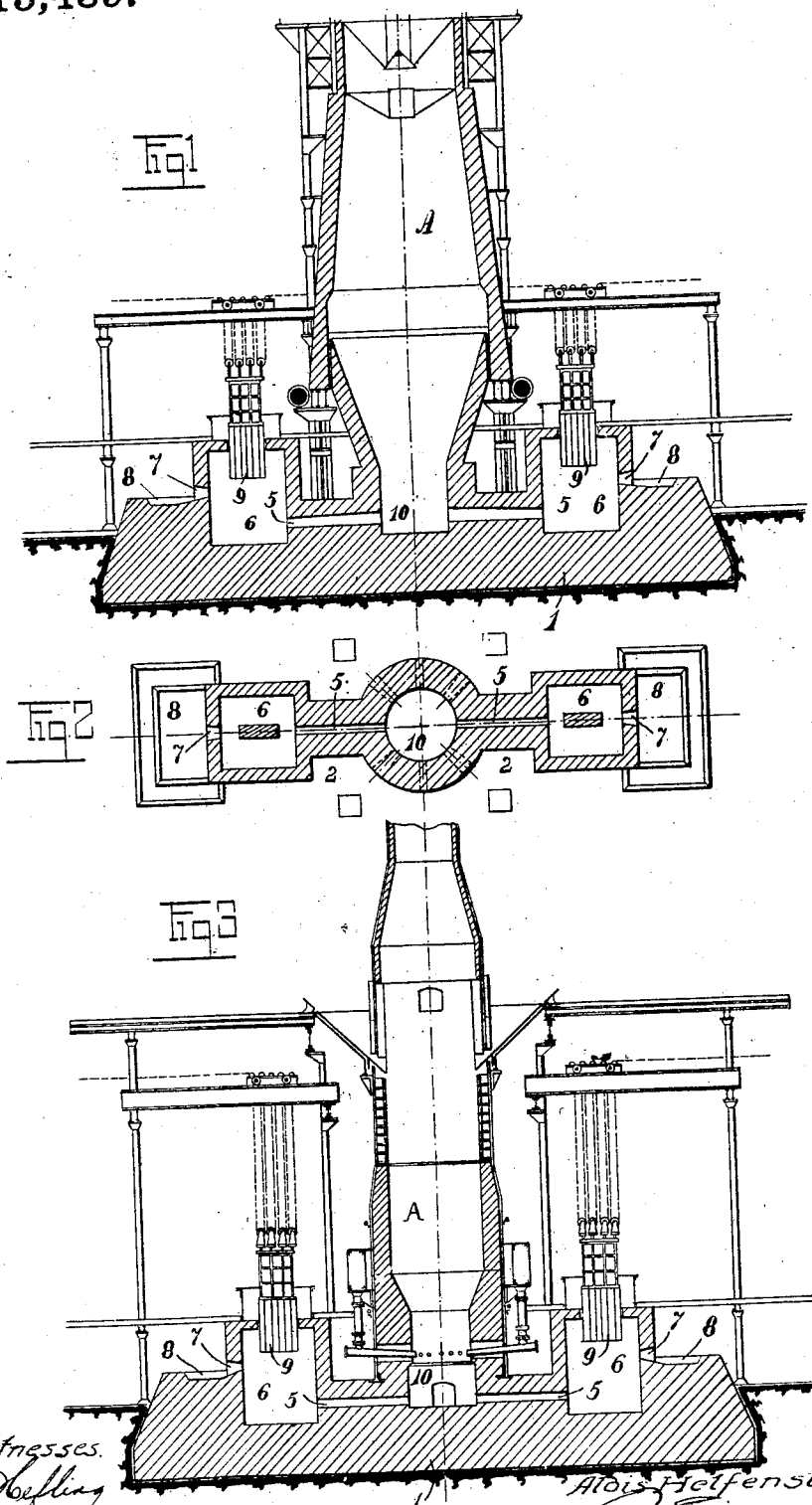


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SMELTING FURNACE WITH ELECTRIC REFINING HEARTHS CONNECTED THERETO.
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UNITED STATES PATENT OFFICE.

ALOIS HELFENSTEIN, OF VIENNA, AUSTRIA-HUNGARY.

SMELTING-FURNACE WITH ELECTRIC REFINING-HEARTHES CONNECTED THERETO.

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Specification of Letters Patent.

Patented Jan. 23, 1912.

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To all whom it may concern:

Be it known that I, ALOIS HELFENSTEIN, a citizen of Switzerland, resident at 4 Pokornigasse XIX., Vienna, Austria-Hungary, have invented new and useful Improvements in Smelting-Furnaces with Electric Refining-Hearths Connected Thereto, of which the following is a specification.

The present invention relates to a smelting furnace, cupola furnace or the like with electric refining arrangement for the production of high grade iron. In the arrangements known for this purpose the electrodes are introduced into the lower part of the furnace. This arrangement in practice offers great difficulties, especially if large forces have to be dealt with, *i. e.*, when large cross sectional areas of the electrodes come into question, because the large forces require above all an absolutely precise regulation of the electrodes, which is impossible with a lateral introduction of same and can be only fulfilled up to now with vertically suspended electrodes. Furthermore, when introducing the electrodes laterally into the lower part of the furnace the packing, the repairs of disturbances, such as the breakage of electrodes, stoppages and the like offer particular difficulties, so that the practical employment of such furnaces is very questionable. Finally with this arrangement refining substances cannot be separately introduced into the lowest part of the furnace at all, or at least only in a very free manner. Also the arrangement of vertical electrodes has been tried, in such a manner that the blast furnace shaft has been arranged as a preliminary shaft above an extended electric refining shaft or chamber. This arrangement, however, possesses the disadvantage that from the preliminary shaft ore and slag of the blast furnace pass into the electric heating chamber so that no pure and exclusive refining action on the iron can be carried through. Finally it is also known to carry out the electrical refining process wholly independently of the blast furnace, for instance by arranging separate electric furnaces in the neighborhood of the blast furnace, in such a manner that the iron from the blast furnace is tapped into the electric refining furnace from time to time. In this arrangement the electric furnaces are generally rotatable, in order to be able to pour off the refined product.

These furnaces, or cupola furnaces it is true, work with a hot charge, but they do not make possible and do not intend to afford a continuous working together of the blast furnace and the electric refining furnaces, in as far as the raw iron is admitted to the refining furnace only casually, and the latter has no working connection with the blast furnace. According to the present invention, however, around the smelting furnace refining chambers are arranged, the iron hearths of which stand in connection with the hearths of the blast furnace by rigid closed off channels, in such a manner that during the working of the blast furnace liquid metal from the same continuously flows into the refining furnaces, where it gradually rises upward and passes into the refining area of the vertical, working electrodes, from whence the refined product flows off outwardly either continuously or is tapped off in certain intervals. Openings in the top wall of each refining chamber permit in a simple manner the introduction into the refining hearths of any desired additions continuously or interruptedly from time to time. This arrangement, therefore, does not only give a continuous refining process of the raw iron in the blast furnace or cupola furnace itself, and an intimate working together of the two processes, while keeping up the independent and clean working of same, but it affords at the same time a simple conductive electric connection of the refining chambers with each other as the current is led from the metal bath and through the channels to the blast or cupola furnace iron pool and from the latter into the other refining chambers, so that the iron pool of the blast furnace hearth forms the lower electrical connection of the refining chambers with each other thus obviating separate lower current supply connections.

In order to be able to deal with refined metal in a simple manner, either in the form of tappings or in the form of a continuous outflow, and in order to give to the whole system of the refining chambers in the zone of the molten iron a greater rigidity, flat trays or troughs are arranged before the refining chambers, which preferably reach up to the height of the tapping holes or overflow edges, and form with the refining chambers an undivided furnace whole. The re-

finer metal flows when tapping or with a continuous outflow into these troughs, and from there to the point where it is worked.

Figures 1 and 2 of the drawings show one form of constructing a blast furnace with two refining chambers in a section and in plan view respectively; and Fig. 3 is a vertical section of a cupola furnace.

The furnace hearth 1 is outwardly extended at two points 2, 2. In the extensions channels 5 with refining chambers 6 connected thereto, are arranged in such a manner that blast furnace A, connecting channels and refining chambers form an undivided furnace whole. The refining chambers are provided with outflow openings 7 in the upper portions thereof. The refining chambers themselves have extended hearths. These extensions outwardly reach up to the height of the outflow holes 7, where they form trays or troughs 8, which serve the purpose of being able to deal with the finished iron masses and at the same time as an outer support. These trays 8 can also be arranged around the refining chambers. Into the refining chambers adjustable electrodes 9 hang from above.

The raw iron in the furnace shaft flows from the hearth 10 through the channels 5 uninterruptedly into the refining chambers 6, rises gradually and flows into the electric heating zone, is there refined through suitable additions and manipulations and flows off as finished product from the outflow 7 over the trays 8 to the point where it is employed. The hanging working electrodes 9 of the different chambers are preferably of different polarity and the high furnace iron pool forms the lower current conducting connection of the refining chambers.

The invention remains, of course, the same if the raw iron is produced by electric heating. In the same manner also other metal can be produced and treated in the furnace.

I claim:—

1. A smelting or cupola furnace, comprising a main shaft or furnace hearth, said shaft being provided with lateral extensions,

a closed refining chamber in each of said extensions, closed channels extending through said extensions, connecting said shaft and said refining chambers the arrangement being such that the main shaft, connecting channels and refining chambers form an undivided furnace whole, an electrode arranged in each refining chamber at the upper portion thereof, each of the said refining chambers being provided with outflow openings arranged at the upper portion thereof, the hearths of the refining chambers being provided with extensions which outwardly reach up to the height of the said outflow openings adapted to serve as trays for the reception of the metal passing through said openings and also adapted to serve as a rigid outer support for the metal zone of the furnace.

2. A smelting or cupola furnace, comprising a main shaft or furnace hearth, said shaft being provided with two lateral extensions oppositely disposed to each other, a closed refining chamber in each of said extensions, a closed channel in each extension connecting said shaft and each refining chamber, the arrangement being such that the main shaft, connecting channels and refining chambers form an undivided furnace whole, an electrode arranged in each refining chamber at the upper portion thereof, each of the said refining chambers being provided with outflow openings arranged at the upper portion thereof, the hearths of the refining chambers being provided with extensions which outwardly reach up to the height of the said outflow openings adapted to serve as a rigid outer support for the metal zone of the furnace, and a tray on the top of said last named extensions arranged beside said outflow openings and adapted to serve for the reception of the metal passing through said openings.

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

ALOIS HELFENSTEIN.

Witnesses:

IGNAZ KUORFELMACHER,
AUGUST FUGGER.