

No. 825,522.

PATENTED JULY 10, 1906.

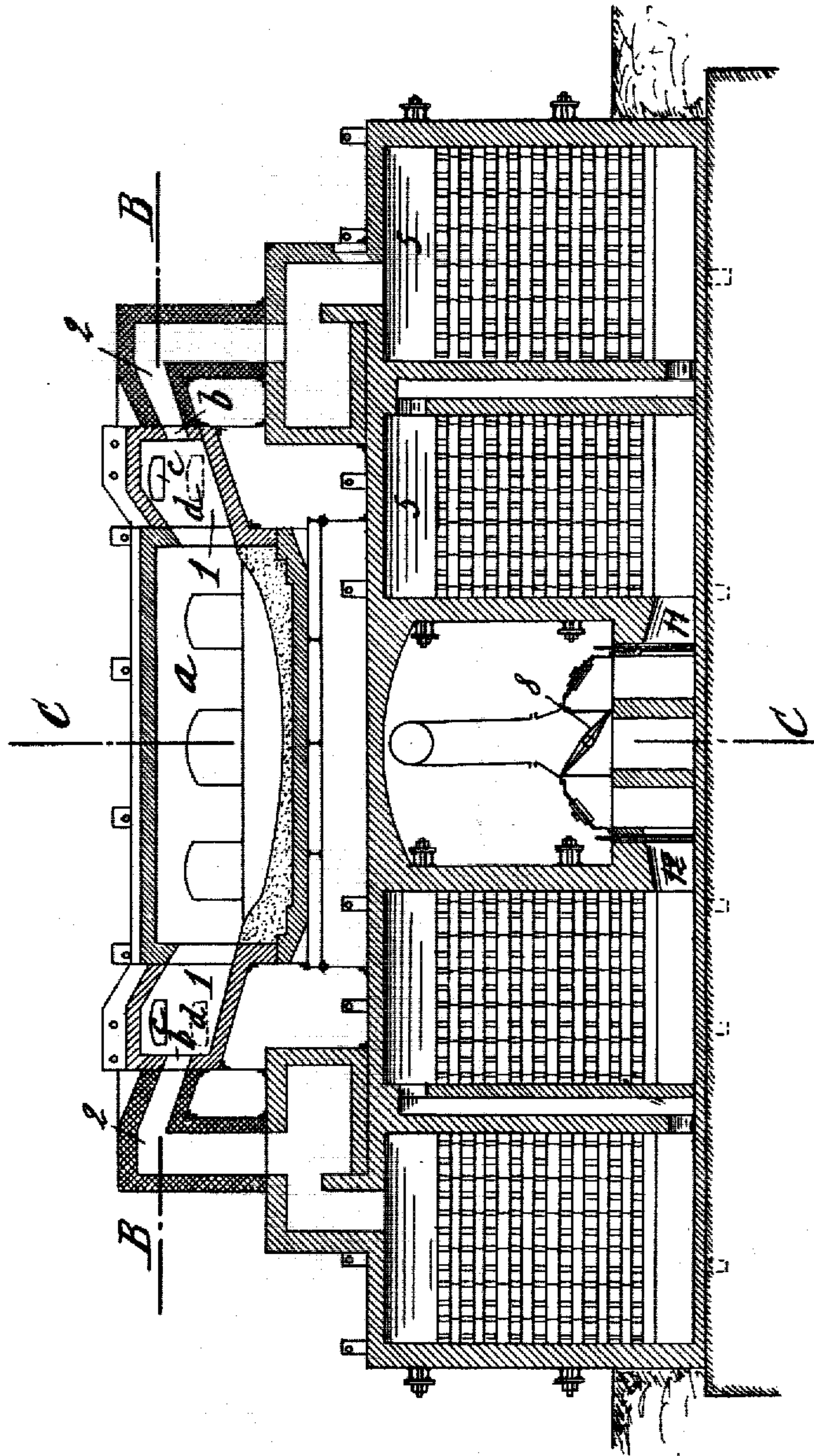
V. DEFAYS.

REVERBERATORY FURNACE FOR THE PRODUCTION OF STEEL.

APPLICATION FILED JULY 28, 1903.

2 SHEETS—SHEET 1.

*Fig. 1.*



WITNESSES:

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*Victor Defays*

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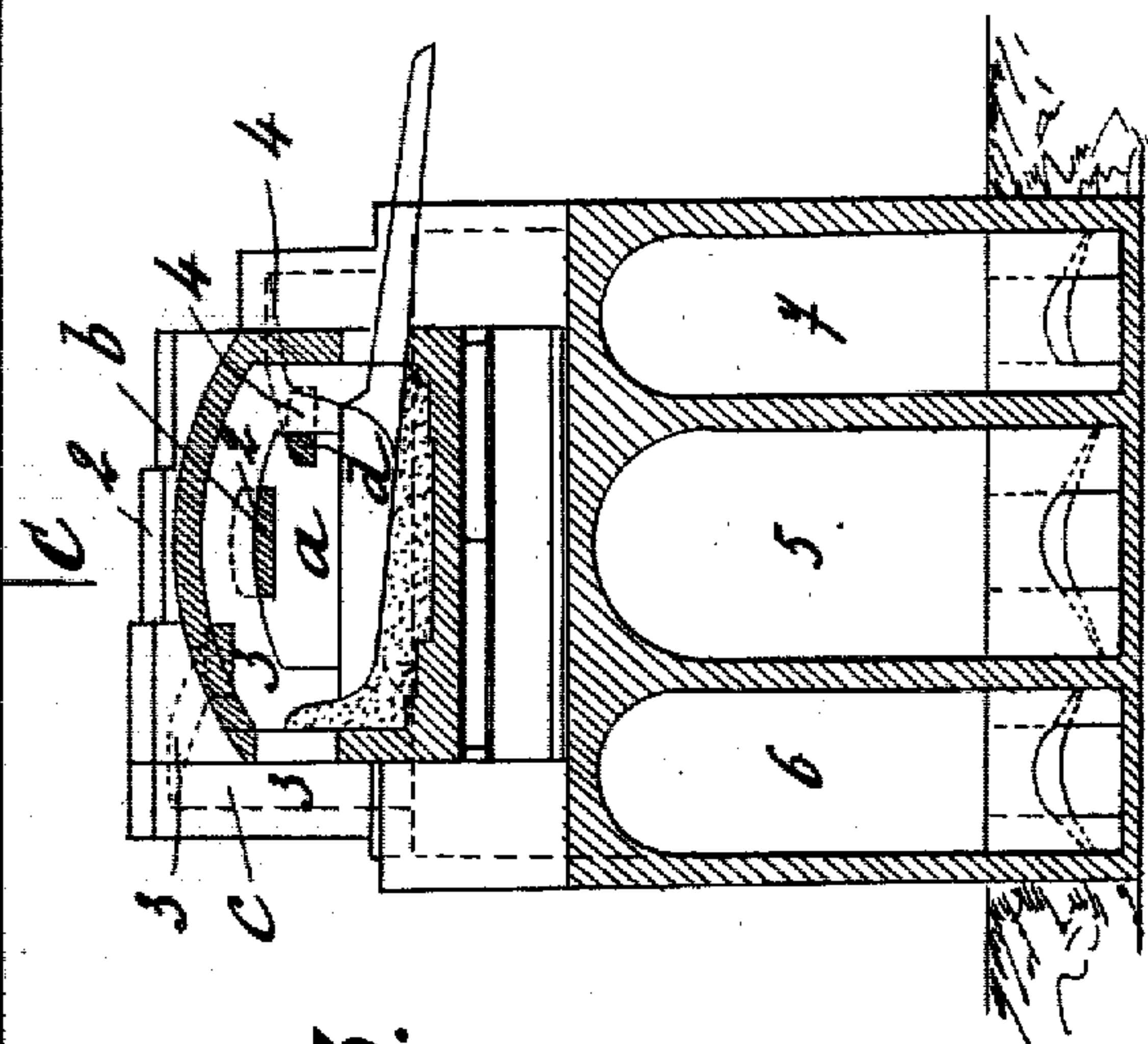
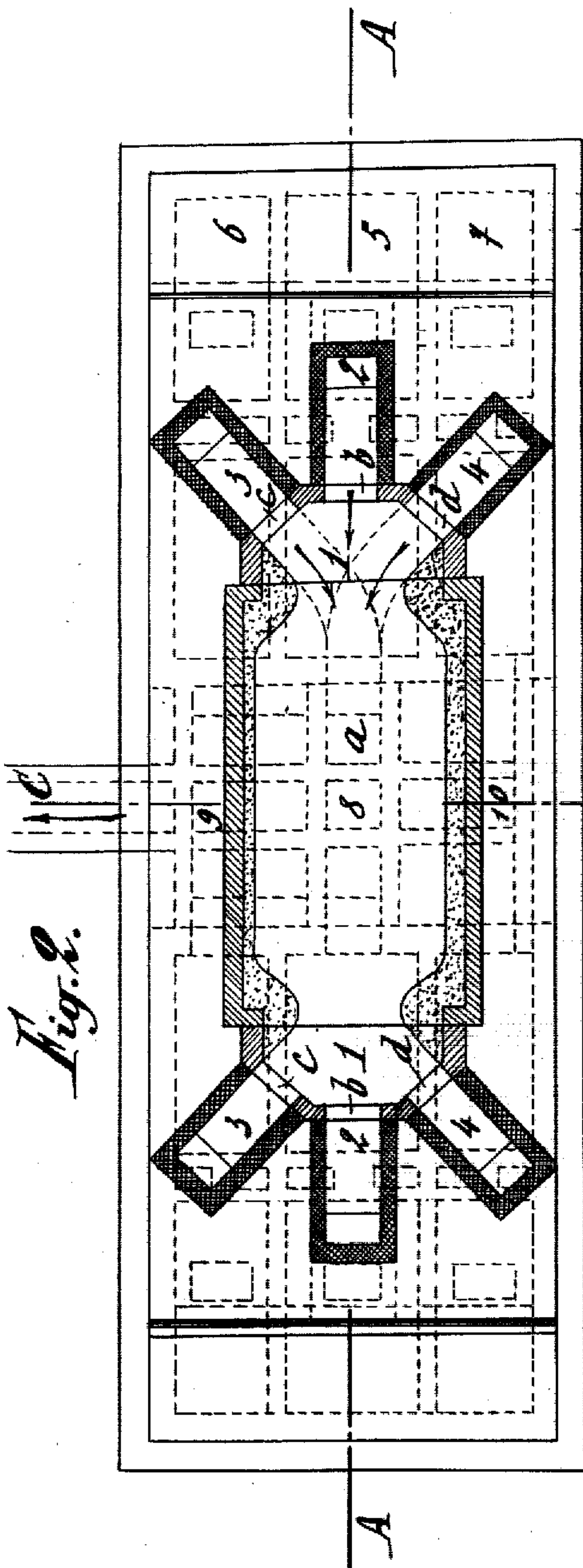
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# UNITED STATES PATENT OFFICE.

VICTOR DEFAYS, OF BRUSSELS, BELGIUM.

## REVERBERATORY FURNACE FOR THE PRODUCTION OF STEEL.

No. 825,522.

Specification of Letters Patent.

Patented July 10, 1906.

Application filed July 28, 1903. Serial No. 167,288.

*To all whom it may concern:*

Be it known that I, VICTOR DEFAYS, engineer, a subject of the King of Belgium, residing at Brussels, in the Kingdom of Belgium, have invented certain new and useful Improvements in Reverberatory Furnaces for the Production of Steel, of which the following is a specification.

This invention relates to improvements in reverberatory furnaces for the production of steel. These improvements have for their object the attainment of more complete combustion of the gases than has hitherto been possible, so that extremely poor gases may be utilized—such as blast-furnace gases, for example—also permitting of the exact regulation of the oxidizing properties of that portion of the flame which passes over the bath, of protecting the part of the furnace through which the flame enters and the air and gas flues through which it passes from the furnace to the recuperation-chambers, against the fusion and disintegration caused by an excessive temperature, of permitting in case of deterioration of the speedy replacement of the exposed portions of the furnace, of facilitating access to the metal-chamber of the furnace, and finally permitting of conveniently and compactly grouping the various constituent parts of the furnace.

In order to attain these ends, the invention consists, broadly, in a novel arrangement of the gas-flues and air-flues, the said arrangement being characterized by the fact that at each extremity of the furnace a gas-flue opens through a suitable aperture into a combustion-chamber between the apertures of two air-flues in such a manner that a sheet or layer of gas is arranged between the sheets of air, the axes of these three flues being preferably convergent, so that the jet of gas may be attacked, for example, from left to right at its upper part by one of the air-jets and from right to left at the lower part by another jet, so that it assumes a gyratory movement, insuring intimate mixture between the combustible and the carrier for oxygen.

The invention is also characterized by the special arrangement of the combustion-chambers and of the flues for supplying the air and gas, the combustion-chamber constituting a removable part independent of the

metal-chamber of the furnace and of each of the air and gas supply flues which are also removable. Another characteristic of the invention is the combination, with these flues, of recuperation-chambers of large capacity and double circulation, arranged with their major axis parallel with the major axis of the metal-chamber of the furnace, these chambers being completed by suitable reversing doors installed between the walls of the chambers corresponding to each extremity of the furnace.

Means for carrying the invention into practice is represented, by way of example, in the accompanying drawings, in which—

Figure 1 is a longitudinal section on the line A A of Fig. 2. Fig. 2 is a horizontal section on the line B B of Fig. 1. Fig. 3 is a section on C C of Fig. 1.

As shown in the drawings, at each extremity of the major axis of the furnace *a* is provided a combustion-chamber 1 independent of the furnace and removable, into which open through the apertures *b c d* or gas and air admissions three flues 2, 3, and 4, of which 2 opens half-way up the combustion-chamber and serves for the admission of the gas, while the two other flues 3 and 4 serve for the supply of air and are arranged one above the other beneath the gas-supply flue 2. The axes of these three flues preferably converge toward the same point, as indicated by the arrows in Fig. 2. These flues are independent of the combustion-chamber 1 and each of them may be readily removed by means of a lifting appliance or suitable conveyer. To each of these flues corresponds at each extremity of the furnace a recuperation-chamber with double circulation, presenting a long path, and the axes of these chambers are arranged parallel with the major axis of the furnace.

In the drawings the gas-chambers are designated by 5 and the air-chambers by 6 and 7. Each group of two chambers arranged opposite one to the other at each extremity of the furnace terminates in a reversing door 8, 9, or 10, installed between the two walls of the chambers.

The furnace is also provided with the ordinary accessories, particularly with a register for regulating the gas and two air-regulating



registers. These registers, which are not represented in the drawings, permit of suitably proportioning the quantities of gas and air which are to enter the chambers, which restore the heat that they have received before the inversion of the doors. Each chamber is further provided with a chimney-register, (11 and 12, for example, in Fig. 1,) permitting of suitably distributing between the various chambers which are being reheated the flame which leaves the furnace.

A general smoke-register, which is not represented, is arranged in the general conduit leading to the chimney.

The operation of the furnace as a whole is similar to that of all furnaces of this kind, nevertheless the arrangement described above modifies the working in the following manner: The flat tongue or sheet of gas coming through the flue 2 and entering the chamber 1 through the gas-inlet *b* is interposed (from the time it enters the combustion-chamber 1) between two tongues of air entering through the air-inlets 3 4. Under the influence of these two tongues of air, one of which attacks it at its upper part and the other at its lower part in convergent directions, the flame tends to assume a gyratory movement, contributing in a large measure to insure an intimate mixture of the combustible and carrier for oxygen, and consequently a complete combustion at a very high temperature, permitting extremely poor gases to be utilized as combustibles. On the other hand, owing to the special form of the chambers 1, the sections of which, Fig. 1, progressively decrease toward the furnace *a*, the superposed tongues or layers of air and gas undergo a certain flattening out and are compressed in such a manner as to penetrate each other, and thus insure in a still more perfect manner the mixture of the gas and air. The oxidizing action of the flame may be regulated at will according to the demands of the work merely by operating registers regulating the quantity of air passing above the flat layer of gas with respect to that passing below. It will also be noticed that owing to the special arrangement of the air and gas flues no portion of the masonry is exposed upon its two faces to the direct action of the flame. One of the two faces of the masonry is always able to radiate its heat, contrary to what is the case in furnaces as hitherto constructed, so that there is no longer any fear of the disintegration or even fusion of certain portions of the combustion-chamber or flues. In case of deterioration each flue may readily be removed and replaced in the same manner as the "combustion-chamber," properly so called. The removal of these parts permits, in addition, of access to the metal-chamber of the furnace at its two extremities, which is par-

ticularly useful in case repairs of any magnitude are necessary.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a reverberatory furnace for the manufacture of steel, the combination with the metal-chamber of independent combustion-chambers at each end of said chamber, and removable gas and air flues entering the former and arranged to impart to the gas and air passing therethrough a rotary motion as the same passes into the metal-chamber.

2. In a reverberatory furnace for the manufacture of steel, the combination with the metal-chamber, of a combustion-chamber at each end of said chamber, central gas-flues connected with said combustion-chambers and laterally-disposed air-flues, also connected with said chambers, and disposed at different levels as to inclose the jet of gas from the gas-flue between two layers of air, and give the same a rotary motion in passing through the metal chamber.

3. In a reverberatory furnace for the manufacture of steel, in combination with the furnace, a combustion-chamber, at each extremity of the longitudinal axis of the furnace, a gas-inlet opening into each combustion-chamber half-way up this chamber, two air-inlets opening into each combustion chamber and arranged one above and the other below the gas-inlet, removable flues independent of the furnace properly so called and joined to these gas and air inlets in the combustion-chambers, and recuperation-chambers communicating with these flues, substantially as described and for the purpose indicated.

4. In a reverberatory furnace for the manufacture of steel, in combination with the furnace, a combustion-chamber at each extremity of the longitudinal axis of the furnace, a gas-inlet opening into each combustion-chamber half-way up this chamber, two air-inlets opening into each combustion-chamber, these air-inlets being arranged one above and the other below the gas-inlet, removable flues, independent of the furnace, joined to these gas and air inlets, their axes converging toward the same point in the combustion-chambers, and recuperation-chambers communicating with these flues, substantially as described above and for the purpose specified.

5. In a reverberatory furnace for the manufacture of steel, in combination with the furnace, a combustion-chamber at each extremity of the furnace, the section of these chambers progressively decreasing toward the furnace, a gas-inlet and two air-inlets formed in these combustion-chambers, the air-inlets being arranged one above and the other below the gas-inlet and laterally of the said gas-inlet in such a manner as to intro-

duce into the furnace a tongue or layer of gas  
arranged between two admissions of air and  
producing the mixture of gas and air by the  
compression of the superposed layers of air  
5 and gas, this compression resulting from the  
diminishing section of the combustion-cham-  
ber toward the furnace, flues conducting the  
gas and air to each combustion-chamber and  
recuperation-chambers communicating with

flues, the whole substantially as described 10  
and for the purpose specified.

In witness whereof I have hereunto set my  
hand in presence of two witnesses.

VICTOR DEFAYS.

Witnesses:

GEORGE BEDE,

GREGORY PHELAN.