

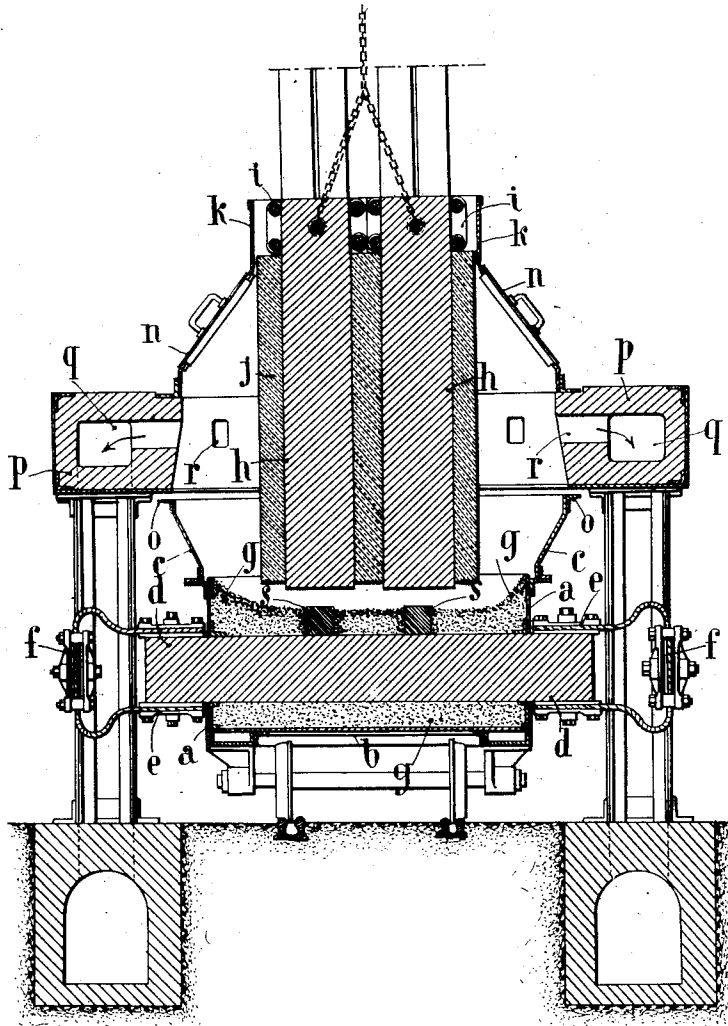
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Patented Nov. 12, 1901.

A. SIMON.
ELECTRIC FURNACE.

(Application filed Feb. 27, 1901.)

(No Model.)



Witnesses:
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UNITED STATES PATENT OFFICE.

ALBERT SIMON, OF BORDEAUX, FRANCE.

ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 878,561, dated November 12, 1901.

Application filed February 27, 1901. Serial No. 49,128. (No model.)

To all whom it may concern:

Be it known that I, ALBERT SIMON, engineer, a citizen of the French Republic, residing at Bordeaux, department of Gironde, France, (whose post-office address is 9 Allées de Courmy, in the said city,) have invented certain new and useful Improvements in Electric Furnaces, especially constructed for the manufacture of iron, manganese, and alloys of these metals, of which the following is a specification.

This invention has for its object to provide an electric furnace more especially constructed for the electrometallurgical manufacture of iron, manganese, and alloys of these metals, this furnace being intended to carry into effect a new process for which I have made application for United States Letters Patent, dated February 27, 1901, Serial No. 49,128.

At first I will briefly describe this process, so that the ground arrangements of the furnace may be more clearly understood.

Attempts hitherto made to obtain iron, manganese, ferromanganese, and alloys of these metals in the electric furnace by reduction of the ores in the presence of carbon have not proved satisfactory owing to the considerable loss of metal and owing to the readiness of the manganese to volatilize. By treating iron ores the losses due to the volatilization are, however, less considerable.

I am aware that the lower oxids of manganese and the oxids of iron are soluble in fused fluorid of calcium. This solution can be used as the electrolyte, and it will yield metallic iron or manganese at the cathode under the action of a continuous electric current suitable to produce simultaneously the electrolytic decomposition and thermic action necessary for melting the mixture and keeping it in a sufficiently fluid condition.

An apparatus constructed for carrying into effect the aforesaid product for the production of iron, manganese, and alloys of these metals is shown in the accompanying drawing, in which is illustrated a vertical sectional view thereof.

It consists, essentially, of a crucible or hearth *a*, of a fireproof material of any suitable composition, mounted on a carriage *b* and provided with raised sides *c*. The cathode is formed of horizontal carbons *d*, arranged on

the base of the hearth or crucible, the casing of which they traverse, and they are connected to the main circuit *f* by means of flexible connections pressed against the carbons by plates *e*. These carbons *d* are embedded in a layer *g* of crushed ferromanganese, the upper level of which rises about to three-fourths of the height of the casing *a*. The purpose of this layer of crushed ferromanganese is to form a conductive mass with the bath of molten metal, as will be more clearly explained below. The upper electrode or anode is formed of four (or more) electric carbons *h*, which are of dimensions proportionate to the power of the furnace and which can be moved vertically by means of levers or the like. The carbons which form the upper electrode *h* are inclosed in a casing or envelop *j* of crushed sing compressed with tar and resin. The manganese contained in this sing is monoxid, so it cannot promote the oxidation of the carbons. The form of this electrode is that of a rectangular prism sliding in a frame *k*, provided on its four sides with charging-openings *n*. The raised sides *c* carry brackets *o* at their upper ends, placed under the brickwork *p*, so as to securely close the interior of the furnace. A channel *q* is provided in the brickwork *p*, the said channel communicating by means of openings *r* with the interior of the furnace and also with a dust-chamber into which the gases arising from the reduction process pass, together with the metallic dust and vapors.

Two small blocks of carbon are arranged at *s*, which blocks extend just above the top of the layer of crushed ferromanganese *g* and serve to prime the furnace, for without these the current could not pass at a low temperature through the said layer of crushed ferromanganese, which then offers too considerable resistance.

After the upper electrodes *h* have been placed in contact with the carbon blocks *s* a mixture of fluor-spar and carbon is gradually introduced through the openings *n*, the constituents being in proportions suited to the voltage at which the furnace is working. The strength or intensity of the electric current in the said carbon blocks *s* being very high by reason of their reduced section a very high temperature is developed around the said

carbon blocks *s*, and thus rapidly melts the mixture which has been fed into the furnace, and thus a bath is formed which gradually penetrates the resisting layer *g*, which becomes more conductive. A temperature is thus gradually produced which finally reaches a normal and invariable degree corresponding to the minimum of volatilization of the metal if the proper strength or intensity of electric current be provided. A current, for example, of, say, forty to fifty watts per square centimeter of the sectional area of the upper electrode enables this result to be obtained. As the work of the furnace proceeds the metal accumulates on the hearth *g*, where it remains in a fluid condition by reason of the superficial resistance of the layer and its low thermic conductivity. When the bath of metal has reached the desired height, it is drawn off in the usual manner.

Having now particularly described and ascertained the nature of this invention and in what manner the same may be performed, I declare that what I claim is—

An electric furnace more especially constructed for the electrometallurgical manufacture of iron, manganese and alloys of these metals, comprising a movable crucible or hearth with raised sides, a cathode mounted on this hearth comprising horizontal carbons *d* embedded in a layer of powdered ferromanganese and two horizontal carbon blocks *s* resting on the carbons *d* for the purpose of priming the furnace, an upper electrode or anode formed with vertically-movable carbons *h* inclosed in a casing of crushed slag compressed with tar and resin, a frame in which slides the upper electrode and charging-openings provided in the frame, substantially as set forth.

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

ALBERT SIMON.

Witnesses:

JAMES L. CHASSEREAU,
GABRIEL FAURE.