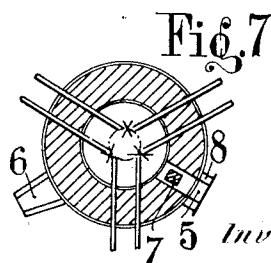
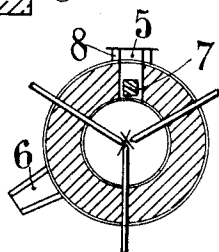
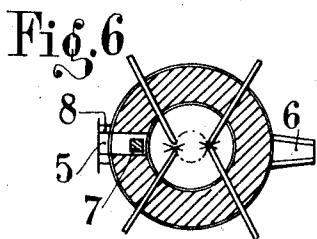
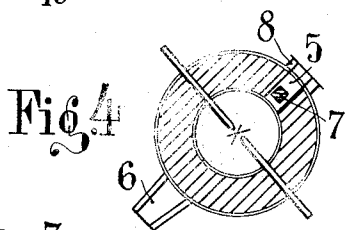
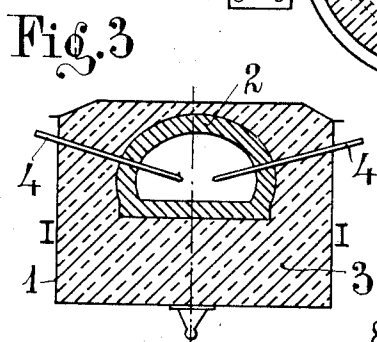
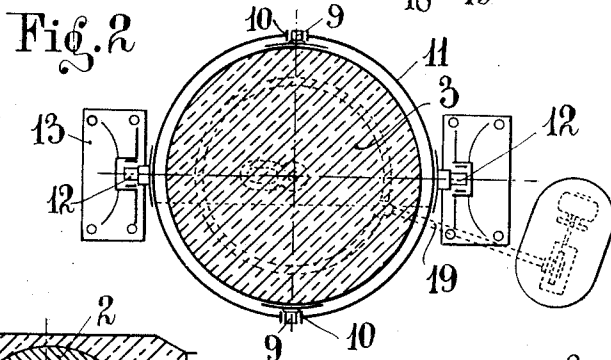
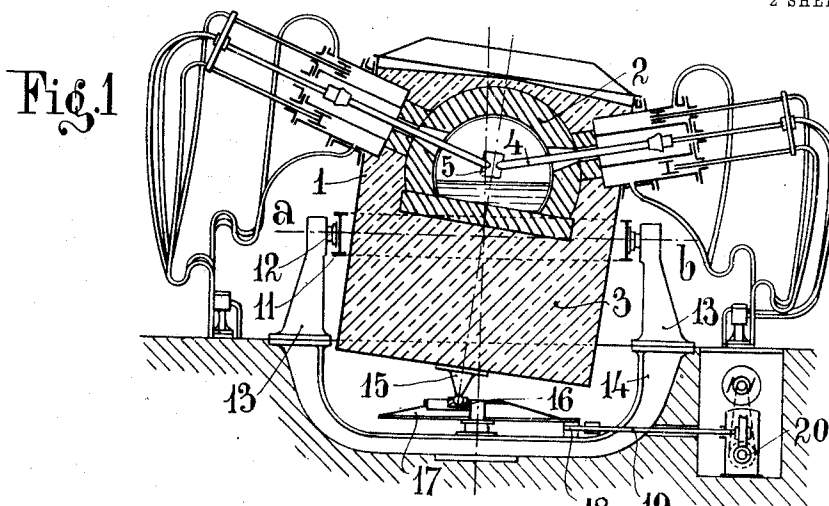


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ELECTRIC FURNACE.
APPLICATION FILED AUG. 7, 1911.

1,024,657.

Patented Apr. 30, 1912.

2 SHEETS-SHEET 1.



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1,024,657.

Patented Apr. 30, 1912.

2 SHEETS—SHEET 2.

Fig. 8

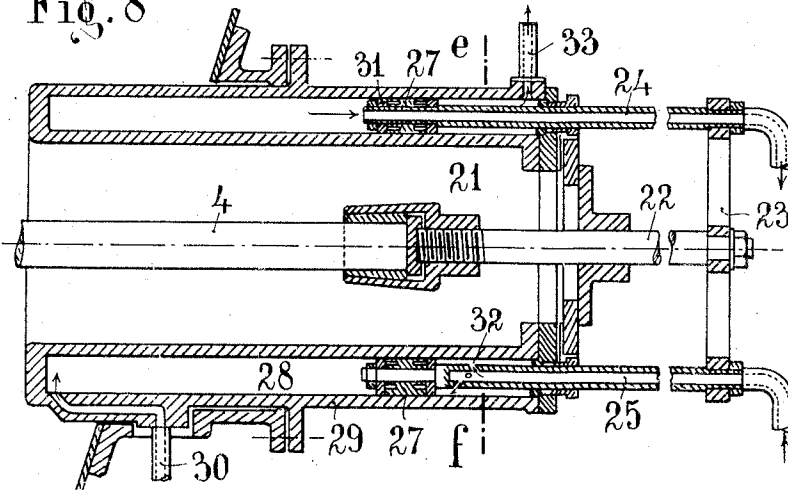


Fig. 9

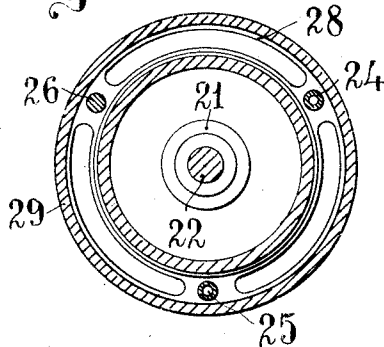


Fig. 10

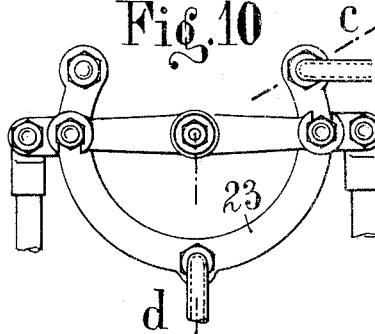


Fig. 14

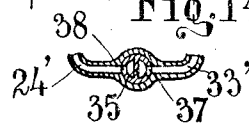


Fig. 11

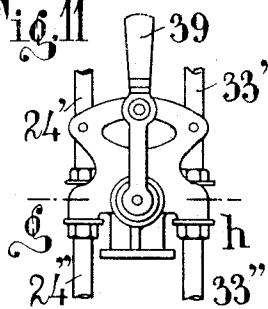


Fig. 12

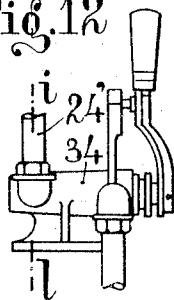
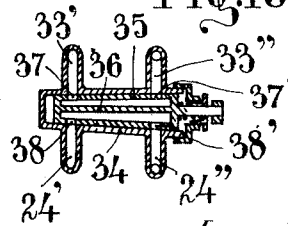


Fig. 13



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UNITED STATES PATENT OFFICE.

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ELECTRIC FURNACE.

1,024,657.

Specification of Letters Patent.

Patented Apr. 30, 1912.

Application filed August 7, 1911. Serial No. 642,837.

To all whom it may concern:

Be it known that I, ERNESTO STASSANO, subject of the King of Italy, residing at Turin, Italy, have invented certain new and useful Improvements in Electric Furnaces, of which the following is a specification.

This invention relates to electric furnaces in which the melting chamber is adapted to be oscillated around two axes mutually perpendicular, and consists in improved construction the object of which is that the maximum thermal energy resulting from the transformation into heat, by the aid of the voltaic arc, of the electric energy may be utilized in metallurgical operations and especially in the metallurgy of iron.

The invention comprises essentially the mounting and control of the furnace chamber so as to obtain a perfect stirring of the whole charge by imparting to the chamber a simple oscillatory movement, the form of the closed chamber affording both a concentration of heat on the charge and a hydraulic control and cooling of the electrodes.

On the accompanying drawings is shown, by way of example, one form of construction for this type of furnace, and Figure 1 is a vertical section of the furnace along the axis; Fig. 2 is a horizontal section on line *a-b* of Fig. 1; Fig. 3 shows a modified form of the furnace chamber, especially suitable for furnaces of large capacity; Figs. 4, 5, 6 and 7 show, diagrammatically, arrangements of electrodes for different kinds of current employed; Fig. 8 is a longitudinal section along the line *c-d* of Fig. 10 of a hydraulically controlled electrode-carrier provided with cooling means; Fig. 9 is a section along *e-f* of Fig. 8; Fig. 10 is a front view of the head of the electrode-carrier; Figs. 11 and 12 are front and side views of a valve for the automatic control of the electrode; Fig. 13 is a section along *g-h* of Fig. 11 and Fig. 14 is a section along *i-l* of Fig. 12.

As will be seen from Figs. 1 and 2, the furnace comprises a casing of sheet iron or other material, inclosing a melting chamber 2 of refractory material which has, in the case of small furnaces, the form of a hollow sphere with the lower portion thereof cut away by a plane constituting the bottom of the furnace (Fig. 1) while with furnaces of large dimensions, the interior cavity has preferably the form of an ellipsoid

with the bottom similarly formed in the lower portion. The term "spheroidal" is used in the claims as a generic term covering either the spherical or ellipsoidal form. This form of furnace chamber has the advantage that the walls of refractory material are rendered more resisting and are reinforced by a filling or envelop 3 of refractory earth, and at the same time the chamber serves to reverberate better on to the charge the heat emanating from the arc or arcs.

The wall of chamber 2 is pierced with holes for the electrodes 4 disposed at a certain inclination, as shown in Fig. 1, for the purpose of directing the arc on to the charge and at such a height that they will not contact therewith. The number of electrodes can be varied according to the type of current adopted and the size and power of the furnace; thus in furnaces of small capacity two electrodes suffice if the current be a continuous or an alternating single phase current (Fig. 4) and three suffice in the case where the furnace is heated by a three-phase current (Fig. 5). In furnaces of greater capacity four or six electrodes (Figs. 6 and 7) may be used, giving two or three independent arcs distributed through the furnace as shown in the drawing.

Furnaces with four electrodes may be heated either by a continuous current or an alternating monophase current (in which case the two arcs are parallel) or again by an alternating two-phase current. Furnaces with six electrodes can be heated by a continuous current by alternating single phase or alternating three phase currents. In the wall of the chamber 2 is a charging opening 5, and on an extension of the bottom is a tapping outlet 6. The charging opening is closed by two closure members 7 and 8 of which one 7 is of refractory material and reaches to the inner end of the opening and the other 8 is of metal and is at the outer end.

The mounting of the furnace is effected as follows:—At two diametrically opposite points of the casing 1 are two pivots 9 mounted in two supports 10 rigidly connected with a ring 11 encircling the casing and having two pivots 12 arranged at 90° with respect to the pivots 9. The pivots 12 are supported by the standards 13, which

in the construction shown in Fig. 1 are connected together by the stirrup 14 passing below the bottom of the furnace.

As will be easily understood, the furnace chamber is so suspended that its vertical axis can assume any inclination to the vertical. The casing 1 has depending from its lower end a pivot 15 the axis of which coincides with that of the casing. The end of this pivot is rounded and has a bearing in a groove or socket formed in a member 16 adjustably mounted on a spoke of a wheel 17 journaled on the stirrup 14. The wheel 17 can be rotated by any suitable means, for instance by means of teeth on its periphery engaging a pinion 18 operated by means of the shaft 19, worm gearing 20 and a small electric motor not shown.

By turning the wheel 17 on its axis the pivot 15 is displaced in a circle so that the axis of the furnace traces out a cone with a circular base. This movement, by reason of the double suspension of the chamber, imparts a rotative movement to the molten mass contained in chamber 2, which movement may be continuous or intermittent corresponding to the motion of the wheel 17. The wheel can if necessary be turned alternately first in one direction and then in another.

In every case the furnace oscillates simply on the pivots 9 and 12 and consequently as far as concerns the stirring up of the metal to be refined the furnace operates as if it were a rotary furnace but with regard to the leading in of the current, the cooling and the control of the electrodes, a simple oscillating furnace. The electrodes 4 have at their rear ends a metal sleeve or coupling 21, to which is attached the controlling rod 22 (Fig. 9) connected by means of the cross bar 23 to other rods 24, 25, 26 which carry an annular member or piston 27 adapted to be displaced in the annular space 28 formed in the wall of the cylindrical chamber 29 through the central hole of which passes the electrode. The cylinder 29 constitutes the cooling chamber for the joint of the electrode. In the annular space 28 of cylinder 29 is established a continuous circulation of water regulated so as to control the electrode by displacing the piston 27 in one direction or in the other, which piston is connected by means of the rods 24, 25, 26 to the electrode-carrier 22. For this purpose in the two portions of the annular space 28 separated by the piston 27, are two independent circulations of water, one from the pipe 30 (communicating with the space 28) through the space 28, hole 31, formed in the piston 27, and the hollow rod 24; the other through rod 25 also hollow, the hole 32 in the said rod, the space 28 and the pipe 33 to outside.

It will be understood that if the discharge

of water by the hollow rod 24 is stopped, the pressure of the water reaching the space 28 by pipe 30 will displace the piston 27 toward the right and consequently also the electrode, while if the water discharging by pipe 33 is stopped the water arriving at the right extremity of the annular space 28 through the hollow rod 23, will displace the piston 27 toward the left.

To control the water circulation, a double cock, allowing either the two discharging pipes to remain open at the same time or one to be closed, may be used. This cock comprises a fixed hollow truncated conical casing 34 from which branch the discharge ducts 24' and 33' communicating with the discharge pipes 24 and 33 and from which also branch the corresponding pipes 24'' and 23''. The plug 34 is divided up into two chambers by a longitudinal partition 36 and is provided with elongated outlets 37, 37', 38, 38' whereby the discharge ducts are put in communication with the internal chambers of the plug. The plug is operated by means of a lever 39 which may be actuated by hand or automatically. When lever 39 is turned, for example to a vertical position, as shown in Fig. 11, water passes from ducts 24', 33' to ducts 24'', 33'' across the outlets 37, 37' and 38, 38', *e* to *d*, and circulates freely. If on the contrary the lever 39 is turned to the left the communication of duct 24 with the inside of the plug is interrupted while water from duct 33' continues to pass across the outlets 37, 37' and consequently is discharged (Fig. 14).

When the pressure increases on the left end of the annular piston 27, the electrode is displaced toward the right. If on the contrary the lever 39 is turned to the right, the discharge from duct 33 is stopped and the pressure of water increases on the right end of piston 27 which moves to displace the electrode to the left. The pressure of the water may be varied from $\frac{1}{2}$ atmosphere to a maximum of 1 atmosphere.

The ducts which lead it to the cylinders of the several electrodes are of flexible piping, for as the furnace oscillates there is no need for special joints. For the same reason the feed of the electrical energy to the electrodes does not necessitate rubbing contacts but only flexible cables grouped with the piping for the water on a support fixed to the base of the apparatus.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In an electric furnace a closed melting chamber arranged in a casing mounted to oscillate in a ring, pivots supporting said ring at an angle of 90° with respect to the pivots of the casing, an arm depending axially from the lower end of the chamber and engaged by a rotating member in an eccentric point of said rotating member.

2. In an electric furnace a closed melting chamber of spheroidal form with the lower portion cut away by a plane constituting the bottom of the chamber, said chamber being
5 arranged in a casing mounted to oscillate in a ring, pivots supporting said ring at an angle of 90° with respect to the pivots of the casing and an arm depending axially from the lower end of the chamber and engaged by a rotating member in an eccentric point of said rotating member.
10

3. In an electric furnace a closed melting chamber arranged in a casing mounted to oscillate in a ring, pivots supporting said
15 ring at an angle of 90° with respect to the pivots of the casing, an arm depending axially from the lower end of the chamber and engaged by a rotating member in an eccentric point of said rotating member, electrodes mounted in chambers provided
20 with water jackets, flexible cables for feeding the current to the electrodes and flexible piping for feeding the water to the water jackets of the electrodes chambers.

25 4. In an electric furnace a closed melting chamber arranged in a casing mounted to oscillate in a ring, pivots supporting said ring at an angle of 90° with respect to the pivots of the casing, an arm depending axially from the lower end of the chamber and engaged by a rotating member in an eccentric point of said rotating member, electrodes mounted in chambers provided with
30 water jackets, an annular piston sliding in the water jacket, means for connecting said piston with the electrode and means for operating the piston by controlling the circulation of water in the water jackets.

5. In an electric furnace a closed melting
40 chamber arranged in a casing mounted to oscillate in a ring, pivots supporting said ring at an angle of 90° with respect to the pivots of the casing, an arm depending axially from the lower end of the chamber and engaged by a rotating member in an eccentric point of the said member, electrodes
45 mounted in chambers provided with water jackets, an annular piston sliding in the water jackets, hollow rods connecting the said annular piston with the cross bars of the electrodes, each of said hollow rods communicating with one of the two portions
50

separated by the piston in the water jacket, and means for controlling the circulation of water in said two portions of the water
55 jackets.

6. In an electric furnace a closed melting chamber arranged in a casing mounted to oscillate in a ring, pivots supporting said
60 ring at an angle of 90° with respect to the pivots of the casing, an arm depending axially from the lower end of the chamber and engaged by a rotating member in an eccentric point of the said member, electrodes mounted in chambers provided with water
65 jackets, an annular piston sliding in the water jackets, hollow rods connecting the said annular piston with the cross bars of the electrode, each of the hollow rods communicating with one of the portions separated by the piston in the water jackets, two independent circulations of water in the said chambers, a double cock for controlling the circulation of water and also the displacement of the annular piston.
70 75

7. In an electric furnace a closed melting chamber arranged in a casing mounted to oscillate in a ring, pivots supporting said
80 ring at an angle of 90° with respect to the pivots of the casing, an arm depending axially from the lower end of the chamber and engaged by a rotating member in an eccentric point of the said member, electrodes mounted in chambers provided with water
85 jackets, an annular piston sliding in the water jacket, hollow rods connecting the said annular piston with the cross bar of the electrodes, each of the hollow rods communicating with one of the chambers formed by the piston in the water jacket, two independent circulations of water in the said chambers, a double cock mounted on the piping for the feeding of water, a plug divided up into two chambers by a longitudinal partition and allowing to stop
90 one or the other of the circulations, and means for operating said plug.
95

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

ERNESTO STASSANO.

Witnesses:

PIERO GIANOLIO,
CARLO TORBAY.