

Nov. 10, 1931.

F. FRENZEL

1,830,992

ELECTRIC FURNACE

Filed Aug. 10, 1929

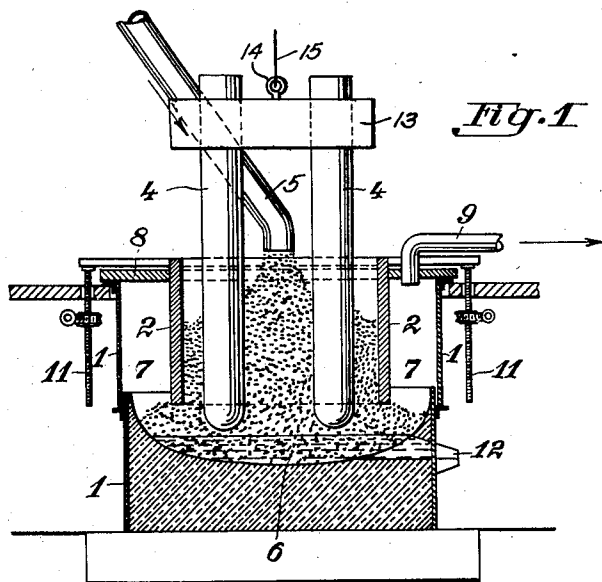


Fig. 1

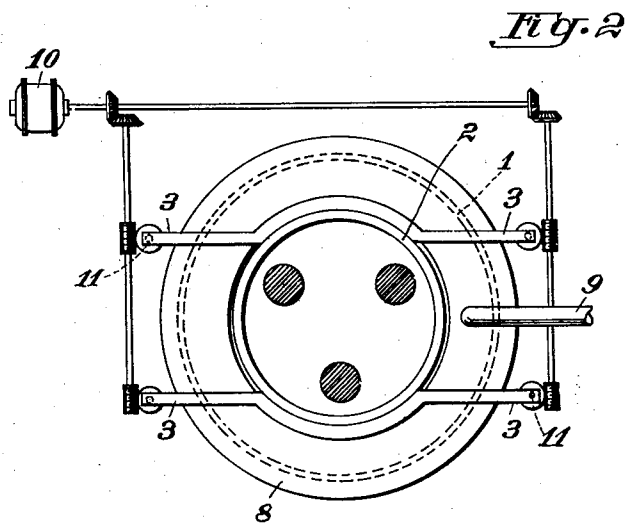


Fig. 2

INVENTOR
FRITZ FRENZEL
BY
H. K. Kiklen & T. R. T. T.
ATTORNEYS.

UNITED STATES PATENT OFFICE

FRITZ FRENZEL, OF DESSAU, GERMANY, ASSIGNOR TO SIEMENS & HALSKE, AKTIEN-GESELLSCHAFT, OF SIEMENSSTADT, NEAR BERLIN, GERMANY, A CORPORATION OF GERMANY

ELECTRIC FURNACE

Application filed August 10, 1929, Serial No. 384,921, and in Germany April 13, 1929.

My invention relates to improvements in electric furnaces, and more specifically to an electric arc furnace.

For melting materials or mixtures of such materials open arc furnaces are frequently used, which comprise a round or square steel shell and a suitably lined troughlike hearth. It is generally not possible to cover up such furnaces completely for the reason that gases and vapors usually develop during the melting process, which must be allowed to escape toward the top in order to avoid undesired secondary reactions. As protection against the chemical and thermal effects of the melt on the furnace walls it is generally necessary to cool the outer shell sufficiently strongly by the application of water. In consequence of this water cooling and the radiation losses due to the impossibility of covering the furnace completely the current consumption of such a furnace is generally very considerable.

The above recited drawbacks are according to my invention eliminated by providing a double-walled furnace shell and a wide hearth or trough with a single wall. The two parts of the furnace shell are preferably open at the bottom and the hearth consisting of a trough or pan is considerably wider than the inner shell. In a furnace of this construction the gases and vapors developed during the melting process may then be exhausted from the annular space or chamber between the two walls of the furnace shell sealed in an air-tight manner at the top. Radiation losses of my improved furnace toward the top are practically avoided altogether. The inner wall of the shell is furthermore heated by the gases sweeping along it so that the dissipation of heat by the water cooling of the shell, as used in known furnaces, is considerably reduced. Preferably the inner and the outer wall of the furnace shell are adapted to be moved or shifted longitudinally or axially in relation to each other. In a preferred construction the inner wall is suspended from laterally disposed points of support, which are arranged to be adjusted vertically. Such a construction of the wall of the furnace has the further advantage, that by adjusting the

inner wall of the furnace shell the most favorable distance of the shell from the hearth may be set. The inner section of the shell, which is subject to the greatest wear and tear, may thus be easily exchanged or repaired.

In the drawings annexed hereto and forming part of my specification an embodiment of my invention is illustrated by way of example.

In the drawings

Fig. 1 is a sectional side elevation, and

Fig. 2, a plan of my improved electric furnace.

Like numerals of reference indicate like parts in both figures.

Referring to the drawings it will be seen that the furnace consists of an outer stationary part 1 and an inner or central movable part 2 suspended from lateral supporting arms 3. These supporting arms 3 are arranged to be raised and lowered by means of an electro-mechanical drive. In a preferred construction screw-threaded spindles 11 driven by an electric motor 10 are employed for adjusting the inner furnace shell 2. One or a plurality of electrodes 4 are introduced into the furnace from the top and are adapted to be adjusted axially in any manner well known in the art. For instance, the electrodes may be carried by a holder 13 provided with an eye 14 connected to the rope or wire 15 of any suitable lifting tackle. For the charge to be melted a feed pipe 5 or a charging gutter or trough is provided by means of which the material is introduced into the furnace. The movable supporting arms of the inner shell may also be combined with the outer shell by a suitable structure, for instance, if it is desired to make the furnace portable.

During the operation of the furnace a liquid melt is formed in the hearth 6 due to the heating of the material by the arc. The gases developing during the melting process pass at 7 into the annular space between the parts 1 and 2 of the furnace shell sealed at the top in air-tight manner by a cover 8. A tube 9 is passed through this cover and connected at its other end to a suitable suction device. The melted material may be dis-

charged or removed from the hearth in any customary manner. In Fig. 1 of the drawings a discharge opening is indicated at 12.

The advantages of my improved furnace reside in the feature that the upper comparatively narrow part of the furnace opening enables a quick charging and good distribution of the material. The heat of the bath of molten material radiated toward the top is not lost, but is utilized for preheating the fresh charge. This fresh charge contained within the inner furnace shell 2, furthermore, protects the electrodes against excessive heating and thus prevents excessive consumption of the carbons. The gases and vapors developing during the melting process are able to escape freely from the hearth of the furnace without being obliged to pass through a layer of raw material located above the hearth. By the layer of gas located between the two walls of the furnace shell the lateral radiation losses are considerably reduced. The hearth zone is so amply dimensioned that the bath is able to expand freely without endangering the inner furnace shell. In consequence of the above advantages my improved furnace enables a considerable increase of the yield of the furnace to be obtained with the same amount of current and permits utilization of the waste gases, if desired. The inner shell of the furnace may be additionally cooled by water or the like.

Various modifications and changes may be made without departing from the spirit and the scope of the invention, and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art.

I claim as my invention:

1. In an electric furnace, the combination of a wide double-walled casing open at the bottom, a hearth the width of which is greater than that of the inner wall of said casing, said hearth being open to the space between the two walls of the casing, means for adjusting the inner wall relatively to the outer wall in an axial direction, and electrodes located interiorly of said inner wall and adjustable lengthwise thereof, independently of the adjustment of said inner wall.

2. In an electric furnace, the combination of a hearth, a double-walled casing arranged above said hearth and open toward the same, the inner wall of said casing being adjustable toward and from said hearth, and electrodes within the central space surrounded by said adjustable inner wall.

3. In an electric furnace, the combination of a wide double-walled casing open at the bottom, electrodes within the space surrounded by the inner wall, a hearth the width of which is greater than that of the inner wall of said casing, said hearth being open to the space between the two walls of the casing, a gastight closure for the upper end of said

space, and means, connected with said space, for removing the gases and vapors produced in the hearth.

4. In an electric furnace, the combination of a wide double-walled casing open at the bottom, electrodes within the space surrounded by the inner wall, a hearth the width of which is greater than that of the inner wall of said casing, said hearth being open to the space between the two walls of the casing, a gastight closure for the upper end of said space, and means for adjusting the inner wall relatively to the outer wall in an axial direction.

5. In an electric furnace, the combination of a stationary outer wall, an inner, axially movable wall, electrodes movable axially independently of said inner wall and located in the central space surrounded by said wall, means for adjusting said inner wall axially relatively to said outer wall and relatively to said electrodes, and a hearth located below said movable inner wall and open to the space between the two walls, said hearth being of greater width than the said inner wall.

6. An electric furnace according to claim 5, in which a gastight closure is provided for the upper end of the space between the two walls, and in which means, connected with said space, are provided for removing gases and vapors produced in the hearth.

In testimony whereof I affix my signature.

FRITZ FRENZEL.