May 19, 1931. P. L. J. MIGUET 1,806,210

ELECTRIC FURNACE

Filed March 20, 1929

Fig. 1

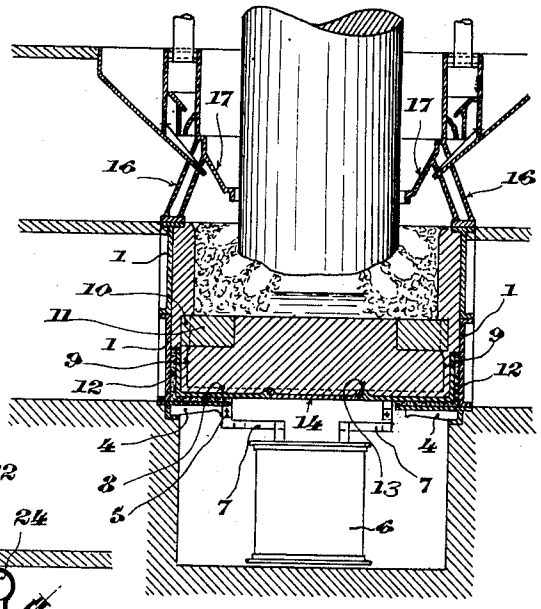


Fig. 2

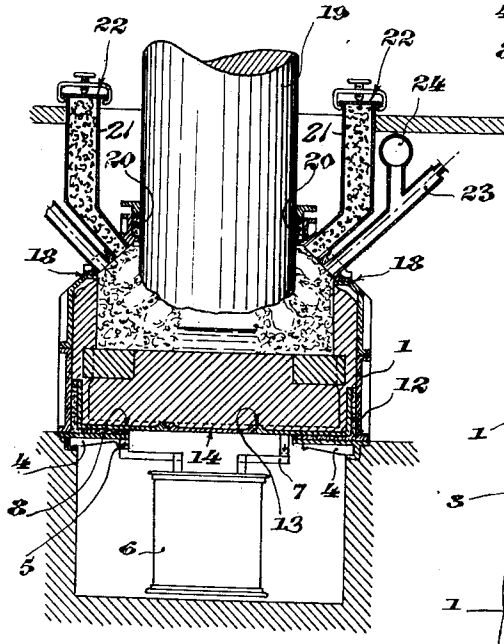


Fig. 3

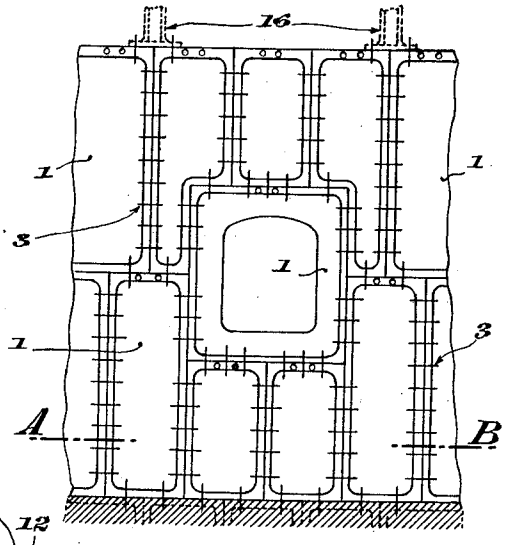
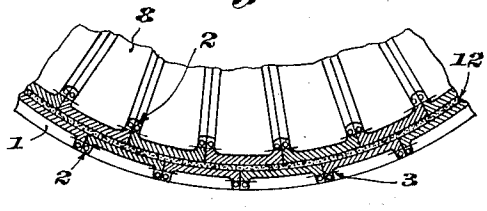


Fig. 4



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UNITED STATES PATENT OFFICE

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ELECTRIC FURNACE

Application filed March 20, 1929, Serial No. 348,645, and in France June 7, 1928.

This invention relates to improvements in electric furnaces, the object being to effect such improvements as to enable the conductors heretofore used to be dispensed with and to employ the furnace casing as a conductor.

In the present invention the usual conductors are replaced by the casing or frame itself as far as the top electrode is concerned and by the ground plate as far as the bottom electrode is concerned. The frame and the ground plate are made of copper or bronze and cooled by water circulation. A thin, tight, and electrical insulating layer of fibro-cement, asbestos or silicated asbestos separates the frame or drum and the bottom plate.

This novel arrangement, while it does away with the sandwiched conductors of the U. S. Patent No. 1,655,324 and their cumbersome passageways shortens considerably the loop of the conductors, divides greatly the conductors of the electric circuit; the frame and the top electrode are electrically grounded instead of the usually grounded bottom plate. Consequently the following possibilities may be attained for all intensities up to 500,000 amperes and over:—

(*a*) to maintain cos ϕ above 0.95.

(*b*) to advantageously position all the apparatus for feeding or stocking, working, raking and also for gaseous recovery.

(*c*) to close the furnaces without the interposing of insulation.

(*d*) to incline the arch of closed furnaces up to 45° and more.

The advantages attached to these possibilities are as follows:

(*a*) obtaining material economies inherent in all large increases in plant size without prejudice to those resulting in a cos ϕ approaching unity.

(*b*) a reduction in the number of persons employed to operate the furnace and an increase in the output of the furnaces.

(*c*) a decrease in installation costs and maintenance for the gaseous recuperation in addition to the usual benefits of the latter.

(*d*) the elimination of all chance of explosion and at the same time greatly facilitating inspection of the parts of the furnace during its operation.

The invention will be described with reference to the accompanying drawings in which

Fig. 1 is a vertical section of an open furnace;

Fig. 2 is a vertical section of a closed furnace;

Fig. 3 is an elevation partially developed of the furnace shown in Fig. 2 to the right of the metal outlet between two conducting arms which connect electro-mechanically with the electrode in known manner;

Fig. 4 is a partial horizontal section on line A—B of Fig. 3.

In the figures, the casing is formed of panels 1 of bronze or cast copper having cooling water circulating ducts 2 the panels being fixed together by bolts or rivets 3. The casing or frame rests on an annular table formed of bracket sections 4 similar to the side panels and provided with terminals 5 connected to one of the secondary terminals of the transformer 6 by very short sandwiched conductors 7.

The bottom plate is formed of sections 8 similar to the bracket sections which support the drum but bent up at 9 and prolonged by plates 10 which are sealed into horizontal bottom electrodes 11 and electrically separated from the casing by a thin insulation 12 which removes the usual contact of the grounded bottom electrode; the bottom plate is connected to the other secondary terminal of the transformer by a conductor 13. A disc 14 with a lead joint at 15 closes the bottom plate.

In the open furnace of Fig. 1, the arms 16 of the conducting ring 17 receive current directly from the conducting casing.

In the closed furnace of Fig. 2, the conical closing arch or top is not electrically insulated but is formed in the same way as the frame and the bottom plate and receives the current from the conducting casing through the joint 18 and transmits it to the semi-fixed electrode 19 through a contact ring of hard coked anthracite grains 20. An annular feed hopper 21 having an annular air-

tight cover 22 is suitably spaced from the electrode and feeds the furnace from the top of the conical arch so as to avoid the formation of any collecting space for gas and reduction vapor, such gas and vapors being caused to pass up the agitating tubes 23 and to be collected in the circular conduit 24.

The regulation of the power being obtained by variation of the voltage the electrode is only moved once each day, for example to lower it to an extent sufficient to compensate for the disintegration during the previous day, to spare the grains in the anthracite packing ring.

The above described figures clearly show:

(*a*) that the induction loop remains sensibly the same as in the earlier patent and that the current is divided to the extreme limit since it is distributed over the whole outer surface of the furnace, that the intensity applied can be considerably increased to gain all the economical advantages in material, labor, production, etc., which result from very high powers without reducing the economy in material resulting from having $\cos \phi$ in the neighborhood of unity;

(*b*) the various operating parts are easily housed without practical limit to the rating or size of the furnace since ducts and sheaves of conductors such as formerly employed and which occupy much space are dispensed with according to my present invention, leaving only the conducting ring having arms 60 m/m in thickness or their equivalent, the space occupied by these elements thus being about eight times less than that previously necessary for furnaces of 240,000 amperes;

(*c*) the casing and the top electrode having the same polarity it is no longer necessary to insulate the furnace arch and no longer necessary to avoid contact of this arch with the conducting charge which not only permits perfect closing and operating conditions, but also permits leaving the arch and the fusion bed permanently in contact;

(*d*) the arch may be inclined at an angle of 45° so as to preserve contact with the fusion bed which has the secondary effect of a wick of a gasoline lamp or of the porous mass of a tube for acetylene gas. No great accumulation of gas is possible and hence chance of explosion is reduced to the minimum. Moreover the improved construction enables all protective arrangements which usually are further obstacles to the inspection and control of the operation of the furnace to be dispensed with.

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

1. An electric furnace comprising a casing to which current is supplied, a movable electrode in contact with the casing and a conducting furnace bottom insulated from the casing.

2. An electric furnace of the class described, having an inclined cover arch in contact with the electrode and the material to be treated and provided with charging devices for feeding the furnace in the neighborhood of the top of the cover and also provided with tubes connected to a circular collecting conduit and adapted to provide access to the furnace for agitating the charge.

3. Electric furnace comprising an outer conductive envelope connected with one of the poles of a source of current, an electrode electrically connected with this envelope, a fusion bed in contact with the electrode, a bottom electrode insulated from the envelope, an inner lining in the lower part of the furnace insulated from the envelope and connected with the bottom electrode and with the other pole of the source of current.

4. Electric furnace comprising a conductive casing connected with one of the poles of a source of current a conductor carrier positioned on conductive brackets which rest on the conductive outer casing to introduce the current to the electrode, an electrode supported by said carrier, a fusion bed in contact with the electrode, a bottom electrode insulated from the casing, an inner lining in the lower part of the furnace insulated from the casing and connected with the bottom electrode and also connected with the other pole.

5. An electric furnace comprising a casing to which current is supplied, an inclined conductive furnace arch electrically connected with said casing and positioned to contact with the fusion bed, an electrode electrically connected with said furnace arch and positioned to contact with the fusion bed, and a conducting bottom electrode insulated from the casing.

6. An electric furnace comprising a conductive casing connected to a source of current, an inclined conductive furnace arch, electrically connected with said casing and positioned to contact with the material to be heated, an electrode electrically connected with said furnace arch and positioned to contact with the material to be treated, a bottom electrode insulated from the casing, a pluraliy of conductive segments arranged to form an annular support for the bottom of the furnace, and a conductor connecting the segments of the annular support and the bottom electrode.

7. An electric furnace comprising a conductive casing connected to a source of current, an inclined conductive furnace arch, electrically connected with said casing and positioned to contact with the material to be treated, an electrode electrically connected with said furnace arch through a conductive stuffing box packed with carbonaceous material, a bottom electrode insulated from the

casing, a plurality of conductive segments aranged to form an annular support for the bottom of the furnace, and a conductor connecting the segments of the annular support and the bottom electrode.

In witness whereof I affix my signature.

PAUL LOUIS JOSEPH MIGUET.