Aug. 7, 1923. 1,463,970

F. POPE

DRAW-OFF FOR ELECTRIC FURNACES

Filed Nov. 20, 1920 2 Sheets-Sheet

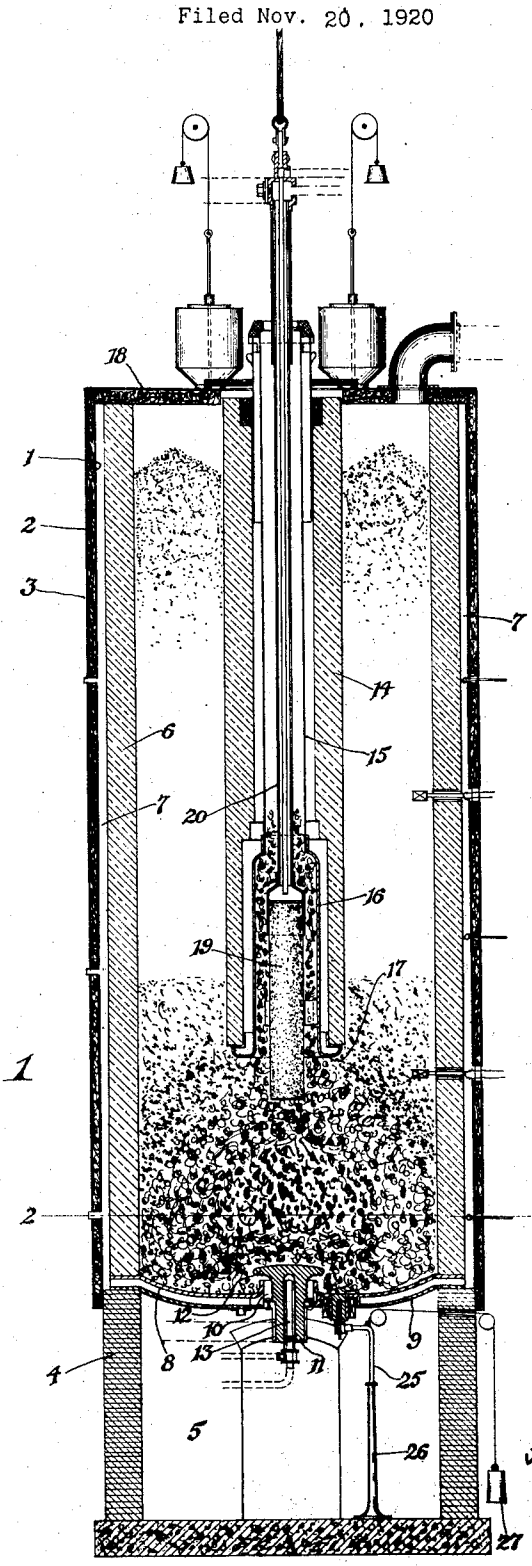


Fig. 1

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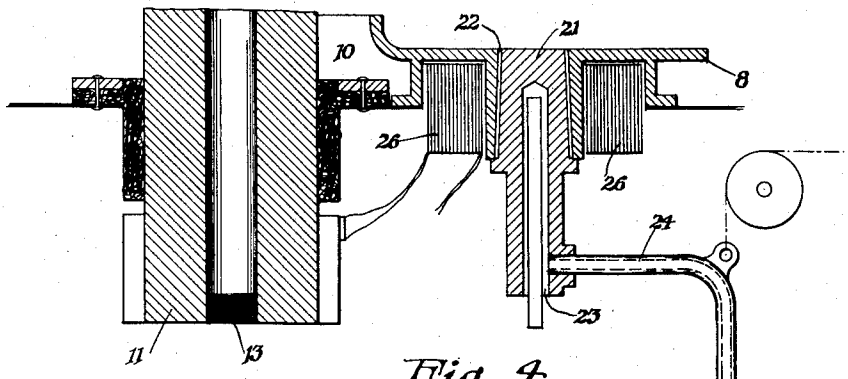


Fig. 4

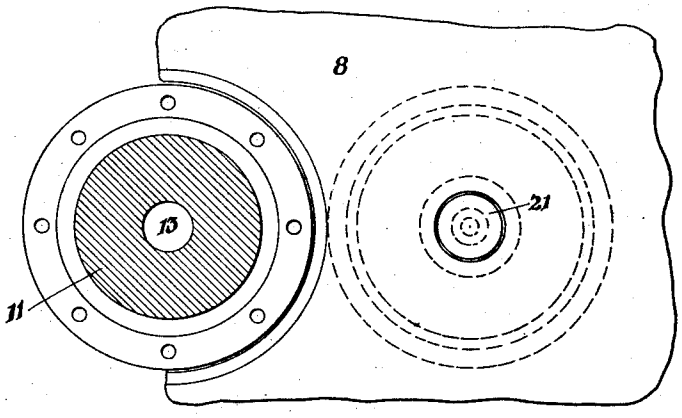


Fig. 3

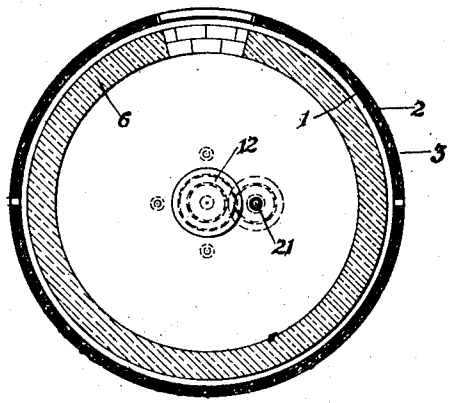
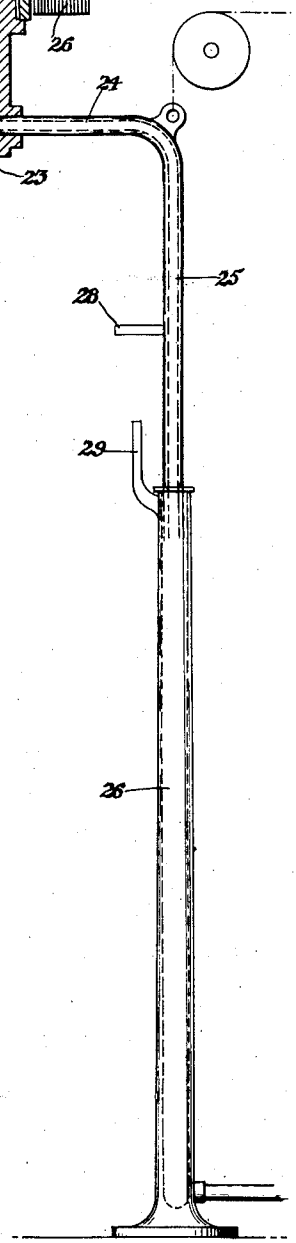


Fig. 2



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Patented Aug. 7, 1923. 1,463,970

UNITED STATES PATENT OFFICE.

FREDERICK POPE, OF NEW YORK, N. Y.

DRAW-OFF FOR ELECTRIC FURNACES.

Application filed November 20, 1920. Serial No. 425,341.

To all whom it may concern:

Be it known that I, FREDERICK POPE, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Draw-Offs for Electric Furnaces, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to furnaces and more particularly to large sized electric furnaces for use in the commercial manufacture of carbon bisulphide or other gaseous compounds similarly produced.

It is an object of the invention to provide an improved construction of furnace of the character mentioned, wherein the manufacture of the resultant product may be carried on more expeditiously and wherewith the operation is facilitated.

It is a further object of the invention to provide an improved electric furnace having simple and efficient means for removal of slag and the like and especially for such removal without stoppage or slowing of the main operation.

Other objects and advantages will be in part noted hereinafter in connection with the following description of the accompanying drawings which illustrate a preferred embodiment of the invention and wherein—

Figure 1 is a central vertical section of the improved furnace,

Fig. 2 is a transverse section thereof on the line 2—2 of Figure 1,

Fig. 3 is a fragmentary view of one of the electrodes in cross section and the construction of the slag removing means, and

Fig. 4 is a fragmentary view on an enlarged scale showing in longitudinal section the construction of one of the electrodes, the slag removing means, and the furnace structure adjoining these parts.

The general construction and operation of the improved furnace as shown is more fully described in the co-pending application of C. E. Taylor, filed November 20, 1920, Serial No. 425,336, and certain patentable features thereof are claimed in said application, to which reference is hereby made.

In general, the furnace comprises a cylinder 1 of sheet iron suitably welded or riveted together and covered with a heat insulating material 2, the surface of the latter being further protected by a casing 3 which also may be of sheet iron or of other suitable substance, such as canvas. The cylinder 1 is supported on a masonry foundation 4 having a lower compartment 5 within which certain parts are arranged as will be hereinafter described and which affords space for removal of deleterious substances from the upper reaction chamber of the furnace. Within the cylinder 1 there is provided a second cylinder 6 constructed of fire brick or a like substance which is preferably free from alkali, so that the parts subjected to chemical action will not serve as a source of calcium, and the two cylinders mentioned are spaced to afford an annular chamber 7 therebetween for the reception of material to be treated, in the present instance, sulphur. The furnace walls 6 rest upon a double bottom 8 of cast iron also supported on the foundation 4 and having a space 9 between its walls in free communication with the sulphur space 7 between the vertical walls of 1 and 6 whereby the sulphur as melted is permitted entrance into the reaction compartment through a central opening 10 and around a lower central electrode 11. This electrode is of cast iron and provided with an enlarged flattened or mushroom top 12, and with a central lower recess 13 for the reception during the reaction of water or other cooling medium whereby the electrode temperature is held down. Another fire brick cylinder 14 is provided centrally within the cylinder 6 and is supported by an internal tube 15 extending from the top and having at its lower end a casting 16 of increased diameter and with a spreading lower end which affords a base for the cylinder 14 and which is provided with a plurality of openings 17 for the emission of material to be treated, in this case also sulphur, fed from the upper end and filling the space between the tube 15 and the inside of the fire brick cylinder 14. The tube 15 is in turn supported from the top of the furnace by a suitable connection to the cover wall 18.

Above the electrode 11 there is provided a complementary carbon electrode 19 suspended from the top of the furnace and disposed centrally within the tube casting 16. The suspension of this carbon electrode is such as to permit its lowering and raising whereby the distance of separation between the adjacent ends of the electrode is controllable as desired.

In operation, the furnace is charged with

lump graphite, or hard coarse carbon, which enters from above within the tube 15 and around an electrode conductor tube 20 and which fills the space mentioned and discharges at the lower end around the carbon electrode disposed centrally of the reaction space whereby the carbon accumulates at the bottom of the furnace in a substantially conical pile overlying the electrode 11 and having its apex adjacent the carbon electrode 19. A quantity of amorphous dried carbon is then discharged into the furnace through suitable openings at the top to fill the space above the coarser carbon and between the walls of the outer and inner fire brick cylinders. The space 7 between the outer cylinder 1 and the enclosed fire brick wall 6, as well as the space between the fire brick cylinder 14 and the enclosed tube 15, are filled with sulphur from above and the operation of the furnace commenced with, preferably, the carbon electrode 19 somewhat lowered to permit rapid and high heating of a smaller mass of the coarse carbon between the two electrodes. As the heating progresses the upper carbon electrode may be raised whereby the field of intense heat is increased until substantially the entire conical mass of coarse carbon in the reaction chamber becomes incandescent. The heat is thence transmitted and melts the sulphur which may discharge into the reaction field as described. It is to be noted that this discharge is facilitated by reason of the free space under the overhanging top of the electrode 11 and the free space immediately below the openings 17 of the casting 16.

In order to permit the withdrawal of slag or other refuse from the furnace, there is provided an improved discharge means in the furnace bottom 8 and in communication with the lower space 5 of the foundation. As shown more clearly in Fig. 4, the slag valve comprises a conical plug 21 having a loose fit through an opening 22 in the bottom casting 8. Plug 21 is provided with a central recess 23 in its lower end whereby the plug may be cooled by circulating water or as otherwise desired. The plug is in turn supported by being mounted on the bent end 24 of a water tube 25 vertically adjustable in a pillar 26 resting on the foundation bottom. The plug and tube 25 are preferably counterweighted as shown in Fig. 1 whereby the lowering or raising of the plug is facilitated. About the opening 22 in the bottom casting 8 and about the slag plug 21 there is provided a copper heating coil 26.

In operation, that is, when the furnace is running, the melted sulphur accumulating in the bottom of the reaction space and covering the lowering casting 8, fills the space between the slag plug 21 and the enclosing walls of the casting and this sulphur is cooled and solidified to form a tight joint by the cooling effect of the plug in turn governed by the water circulation therethrough. When, however, it is desired to draw off the slag, or other refuse, from the bottom of the reaction space, the water circulation is stopped and an alternating current is sent through the copper coil 26 to heat the plug and the metal surrounding it by the action of the Foucault currents generated in the adjacent iron, so that the solidified and sealing sulphur is melted, whereupon the counterweight 27 may be raised and the plug 21 lowered to open the valve. Preferably the plug supporting tube 25 is provided with an offset arm 28 and the pillar 26 with inclined complementary offset 29 so that as the plug moves to its lower limit an automatic rotation of the tube 25 is effected and the plug is moved through a transverse arc to free the same from the stream of ejected slag then flowing through the opening 22. The water cooling of the plug is then resumed to place it in condition for reclosure of the valve, which action is effected by a lowering of the counterweight 27 so that the plug is again projected within the bottom opening 22. The current through the coil 26 is now broken so that the sulphur again is trapped in the space about the plug and solidifies to seal the discharge valve.

It is to be noted that the improved construction permits the periodic withdrawal of the slag or base products at intervals as desired and without stopping the main operation of the furnace or delaying its action.

Having described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. In a furnace of the character described, in combination, an enclosure for the reaction space including a bottom wall having an opening, a plug loosely fitting said opening, and controllable means to heat or cool said plug for the purpose described.

2. In a furnace of the character described, in combination, a cylindrical enclosure for the reaction space, a double bottom therefor having an opening, and a tapered plug to seat in said opening and spaced slightly from the walls thereof for reception of fusible sealing material.

3. In an electric furnace for making carbon bisulphide, in combination, an enclosing wall for the reaction space, and a draw-off therefor comprising an opening in said wall, a plug to close said opening, and means to cool said plug for solidifying treated material thereabout.

4. In an electric furnace, in combination, a furnace including a fire-brick cylinder and a concave bottom therefor having an opening, a slag chamber below said bottom, a plug to close said opening, controllable means to cool said plug for solidifying the slag adjacent thereto, and means to heat said plug for facilitating its removal.

5. In an electric furnace, in combination, a vertical reaction chamber having a bottom wall provided with a slag outlet opening, a draw-off chamber below said bottom wall, a plug to close said opening, and means to bodily swing said plug from below said opening when said plug is lowered therefrom.

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

FREDERICK POPE.

Witnesses:
H. M. SEAMANS,
J. THOMSON.