W. K. BOOTH.

FURNACE.

APPLICATION FILED DEC. 3, 1919.

1,418,773.

Patented June 6, 1922.

2 SHEETS—SHEET 1.

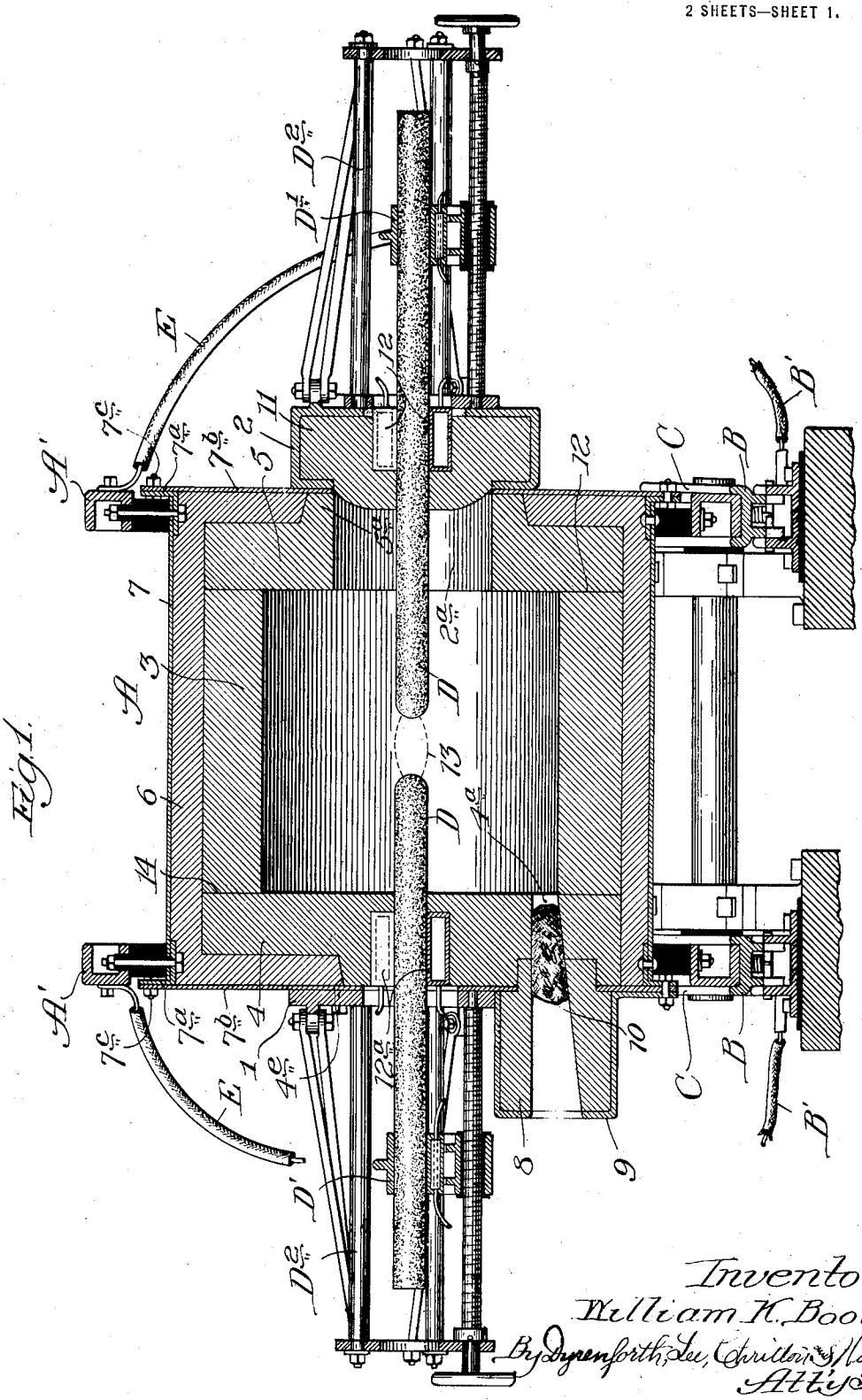


Fig. 1.

Inventor:
William K. Booth,
By Dyrenforth, Lee, Christian & Hines.
Attys.

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2 SHEETS—SHEET 2.

Fig. 2.

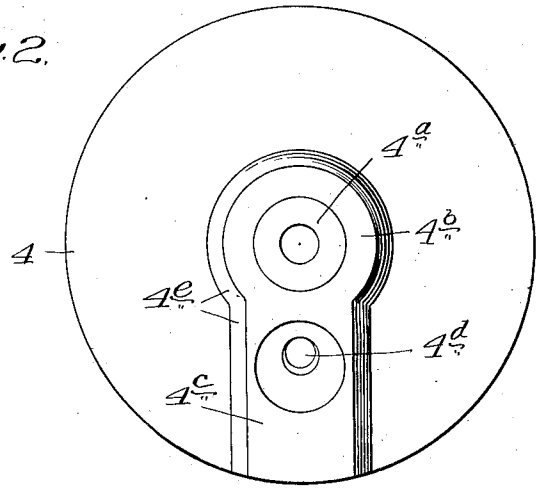
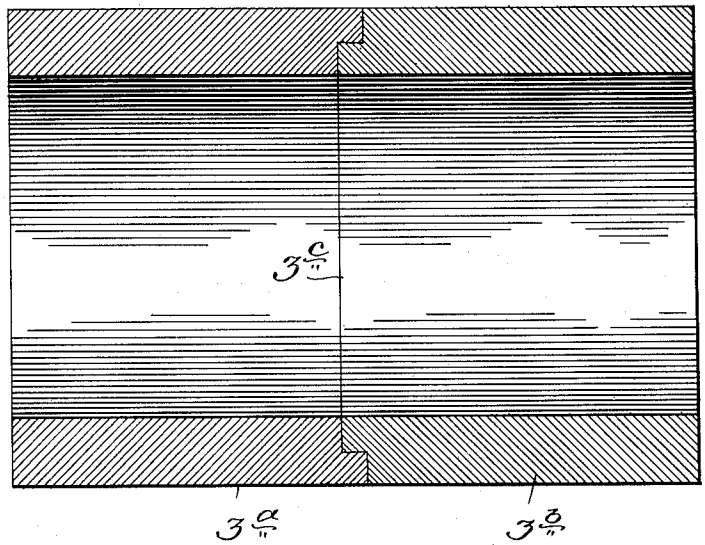


Fig. 3.



Inventor:
William K. Booth,
By Dyrenforth, Lee, Chrittons & Wiles,
Attys.

UNITED STATES PATENT OFFICE.

WILLIAM K. BOOTH, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE BOOTH ELECTRIC FURNACE CO., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

FURNACE.

1,418,773. Specification of Letters Patent. Patented June 6, 1922.

Application filed December 3, 1919. Serial No. 342,131.

To all whom it may concern:

Be it known that I, WILLIAM K. BOOTH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Furnaces, of which the following is a specification.

The present invention relates to furnaces for melting metals, and for metallurgical purposes, and more particularly to electric furnaces having cylindrical bodies.

The primary object is to provide an improved furnace of this character having special provision for lining the furnace, and for renewing the lining economically and with facility.

Heretofore it has been the practice to line such furnaces with a large number of fireclay bricks laid in a suitable cement, or mortar. This results in a large number of joints in the furnace, and in the operation of such a furnace the joints are quickly attacked, leading to quick deterioration and destruction of the lining. Such a lining is especially susceptible to quick deterioration when the furnace is used for melting materials which contain lead, or other constituents which become highly fluid when melted; and it is very difficult to make a joint which will not allow a highly fluid molten metal to seep through the joints and collect back of the lining, thereby reducing the efficiency of the furnace and tending to quick deterioration of the furnace. These difficulties have been recognized, but heretofore no practical method of overcoming them has been devised. It has been proposed to tamp a lining in position in this type of furnace, but such a method has not proven practicable.

The difficulties noted above are obviated and the construction of the furnace and relining the same, when necessary, is facilitated by the invention herein described.

The invention is illustrated in its preferred embodiment in the acompanying drawings, in which—

Fig. 1 represents a vertical sectional view of an improved furnace embodying the invention; Fig. 2, an outer face view of one of the end-sections of the melted sectional refractory lining employed; and Fig. 3, a sectional view showing a modification of the molded annular lining body.

In the illustration given, A represents a cylindrical furnace-body which is equipped with annular supporting tracks A′, which encircle and are insulatingly mounted on the furnace-body and which serve as annular contact members; B, B, represent shoes, or contact members, which engage the members A′ and are supplied with current through conductors B′ from any suitable electric source (not shown); C, C, supporting rolls for the furnace-body, which support the furnace-body through the medium of annular tracks A′, the mechanism C being provided with means (not shown) whereby the furnace-body may be rotated or oscillated on its axis; D, D, a pair of electrodes which extend through the end-walls of the furnace and are carried by electrode clamps D′ mounted on frames D^2 supported on the end-walls of the furnace; and E, E, flexible electric conductors connecting the annular contact members A′ with the electrode clamps. In the illustration given, one of the electrode supporting frames D^2 is carried by the end plate 1, secured to one of the end walls of the furnace-body; and the other electrode supporting frame is carried by a door 2, which is mounted on the end wall of the furnace and serves as a closure for a charging opening 2^a in one of the end-sections of the lining.

As shown in Fig. 1, the lining comprises an annular body 3 of molded refractory material, such as fireclay, this annular body being in the form of a complete integral annulus; a pair of molded end-sections 4 and 5 which flank the annulus 3 and are composed of suitable refractory material, such as fireclay; and a packing of heat insulation material 6, such as kieselguhr, interposed between the molded lining sections and the metal shell of the furnace-body. The shell is shown as comprising a cylindrical member 7 of sheet-metal, which is provided at its ends with outturned flanges 7^a; and a pair of sheet-metal end-plates 7^b which are detachably secured to the flanges 7^a by means of bolts 7^c.

The molded end-section 4 of the lining is in the form of a heavy disk, which is provided with a central opening 4^a for the electrode. The disk 4 is provided on its outer surface with a raised portion, or embossment, 4^b, which is somewhat in the nature of a hub, this hub being provided with a radial extension 4^c The embossment is

adapted to bear against the sheet-metal end-plate 7^b, and the surrounding space is filled by the packing material 6. The radial extension 4^c of the embossment is provided with a tap-hole 4^d, which is counter-sunk at its outer end to receive the reduced inner end of the lining 8 of a discharge spout 9. The tap-hole is adapted to be closed by a plug of fireclay 10.

The door 2 is provided with a refractory lining 11, within which is inserted a water-cooled sleeve 12. The central perforation through the disk 4 is provided with a counter-sink which receives a water-cooled sleeve 12^a.

The molded end-section 5 has its outer surface provided with a hub-extension 5^a which bears against the end-plate 7^b. The surrounding space is filled with the insulation packing material 6. The charging opening 2^a extends through the end-section 5.

In operation, the furnace-body is supported and rotated, or oscillated, through the medium of the rollers C; the annular contact members A′ are energized through the medium of the shoes, or brushes, B; and the current passes through the conductors E to the electrode clamps, and the circuit is completed through the electrodes and an arc 13 between the inner ends thereof. It will be noted that the principal joints which are subjected to the direct action of the molten metal in the furnace are the circumferential joints 14 at what may be termed the annular corners of the furnace. Because of their location, these joints have a tendency to clog or fill up in the corners of the furnace, thus protecting the joints. When it becomes necessary, however, to reline the furnace, this may readily be effected by removing the right-hand end-plate shown in Fig. 1 and substituting a new lining. In putting the lining in place in the first instance, or in renewing the lining, the packing material 6 may be tamped against the left-hand end-plate 7^b, a suitable form being employed, if desired, to retain a space for the embossment, or projection, 4^b, of the melted end-section 4. It will be noted from Fig. 2 that the embossment is provided with a bevel portion 4^e, which enables the molded end-section of the lining to be forced into proper position with facility. After the end-section 4 is in position, the annular section 3 may be inserted and the packing material 6 tamped into the annular space surrounding the section 3. The remainder of the work of lining the furnace may be completed in an obvious manner.

Fig. 3 illustrates a modification of the molded annular lining body, which may be employed for furnaces of too great length to render it convenient to make the annulus of one section. Thus, the annulus may be composed of two annular sections 3^a and 3^b, one of which has a reduced extension 3^c which fits into a corresponding annular recess in the other section. Thus, preferably, the joint is broken, or off-set, at the junction plane.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitation should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

What I regard as new, and desire to secure by Letters Patent, is:

1. A furnace-body, comprising an annular metal shell provided with a detachable end-plate, and a lining of molded sections of refractory material insertable through the end of said shell and comprising an annular body having a substantially cylindrical molded integral section and a pair of end-sections flanking said annular body.

2. A furnace-body, comprising an annular metal shell provided with a detachable end-plate, a lining of molded sections of refractory material insertable through the end of said shell and comprising an annular body having a substantially cylindrical molded integral section and a pair of end-sections flanking said annular body, and a packing of heat insulation material interposed between said molded sections and said shell.

3. A furnace body, comprising an annular metal shell provided with a detachable end-plate and a lining of molded sections of refractory material insertable through the end of said shell and comprising an annular body having a substantially cylindrical molded integral section and a pair of end-sections flanking said annular body, said end-sections having hub-portions bearing against the end-plates of the metal shell, and a packing of heat insulation material interposed between said molded sections and said shell.

4. A furnace-body, comprising an annular metal shell provided with detachable end-plates and a lining of molded sections of refractory material insertable through the end of said shell and comprising an annular body having a substantially cylindrical molded integral section and a pair of end-sections flanking said annular body, said end-sections having their outer surfaces provided with hub-extensions and having openings through which electrodes may extend.

5. A furnace-body, comprising an annular metal shell provided with detachable end-plates and a lining of molded sections of refractory material insertable through the end of said shell and comprising an annular body having a substantially cylindrical section and a pair of end-sections flanking said annular body, one of said end-sections hav-

ing its outer surface equipped with a hub-portion and a radial extension with a tap-opening extending therethrough, and a spout applied to the corresponding end of the furnace and having a refractory lining provided with an extension fitted into a counter-sink at the outer end of said tap-hole.

6. A furnace lining, comprising an annular body which includes a molded cylindrical integral section and a pair of molded end-sections flanking said annular body.

7. A furnace lining, comprising an integral molded annular section of refractory material and a pair of molded end-sections of refractory material flanking said annular body.

8. A furnace lining, comprising a plurality of abutting molded integral annular sections of refractory material and a pair of molded end-sections of refractory material flanking said annular body and provided with central openings through which electrodes may extend.

WILLIAM K. BOOTH.