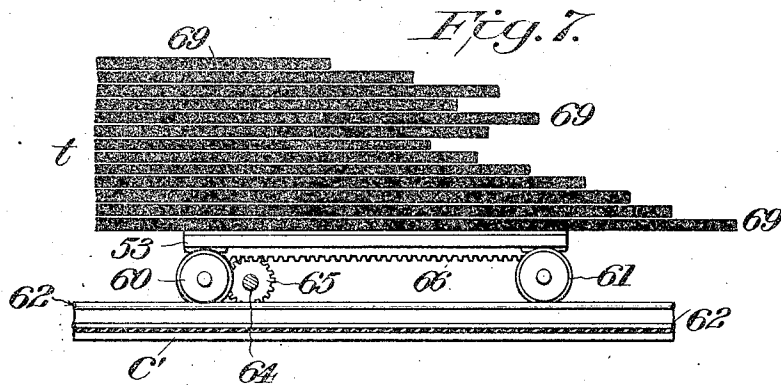
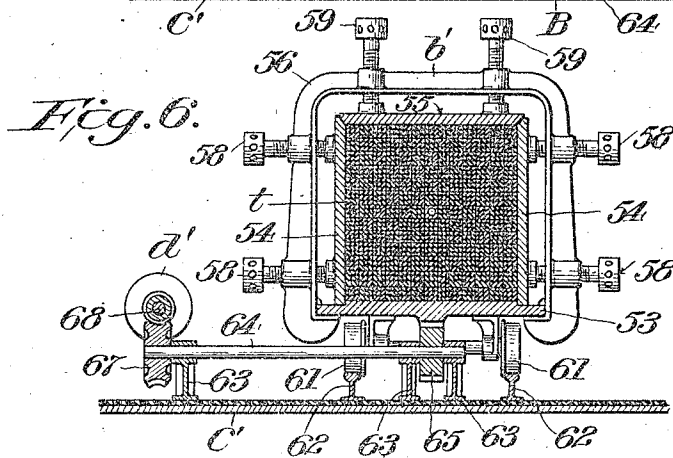
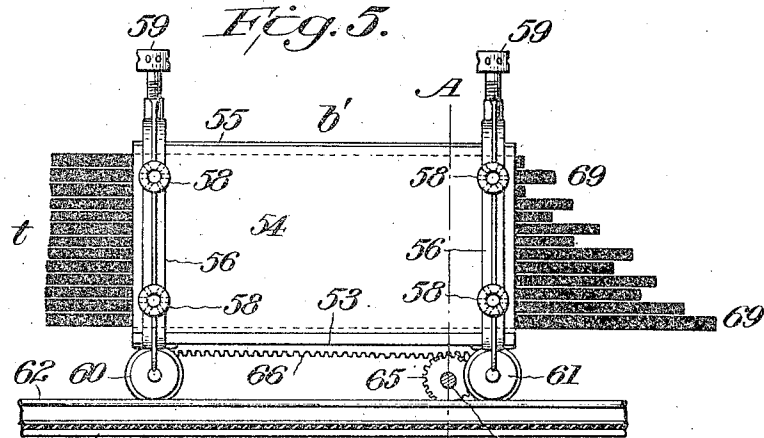


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METHOD AND APPARATUS FOR PRODUCING AND FEEDING FURNACE ELECTRODES.
APPLICATION FILED JAN. 7, 1911.

1,043,481.

Patented Nov. 5, 1912.

SHEETS-SHEET 2.



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METHOD AND APPARATUS FOR PRODUCING AND FEEDING FURNACE-ELECTRODES.

1,043,481.

Specification of Letters Patent.

Patented Nov. 5, 1912.

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To all whom it may concern:

Be it known that I, EDWARD R. TAYLOR, a citizen of the United States of America, and a resident of Penn Yan, in the State of New York, have invented a new and useful Improvement in Methods and Apparatus for Producing and Feeding Furnace-Electrodes, of which the following is a specification.

This invention relates to the production and use of those "stemless" furnace electrodes each of which is composed of a number of units rectangular in cross section, united by a suitable cement into a sufficiently homogeneous mass, and adapted to be fed endwise into the furnace as the inner end of the electrode sloughs off.

The present invention consists in a novel method of alternately building up and feeding in such electrodes, and in the mechanical devices or apparatus by which said method is carried into effect, as hereinafter particularly described and claimed.

Primarily this invention is additional to an improvement in electric smelting furnaces set forth in my previous specification forming part of an application for United States Letters Patent filed July 7, 1910, and allowed July 27, 1910, Serial No. 570,836; hereinafter referred to as my companion specification.

The leading objects of the present invention are the production *in situ*, or practically *in situ*, that is to say at the furnace (hereinafter referred to as "*in situ*") of the electrodes of the large sizes required for electric furnaces adapted for operation on a commercial scale; and the manipulation of such electrodes, especially horizontal and inclined electrodes, known in common as "horizontal electrodes" with reference to feeding them endwise into the furnace as required.

Other objects will be set forth in the general description, which follows.

Two sheets of drawings accompany this specification as parts thereof.

Figure 1 represents a vertical section through the building up and feeding in apparatus of the present invention and a portion of a "horizontal" stemless electrode, in juxtaposition to the wall of an electric furnace provided with certain accessories; Figs. 2 and 3 represent respectively longitudinal and transverse sections of the preferred electrode product, on a larger scale; Fig. 4 is a perspective view of one of the tubular

electrode units hereinafter more particularly described; Fig. 5 is a side view, partly in section, of the building up and feeding in apparatus; Fig. 6 represents an end view of the same partly in section on the line A-B, Fig. 5; and Fig. 7 is a sectional side view of the same apparatus with the detachable parts removed.

Like reference characters refer to like parts in all the figures; and, to facilitate comparison, the same reference characters are used for the several parts as in said companion specification.

A "stemless" horizontal electrode adapted to be produced and fed by the present method is represented as a whole at *t*. Such an electrode broadly considered consists, as a whole, of a solid or substantially solid rectangular body of suitable electrode carbon. Special provision is required for the employment of horizontal electrodes of this form, owing to the size and weight required in a furnace adapted for reducing ore on a commercial scale, or for like practical use. In the smelting furnace described in said companion specification, a fragment of which is shown in Fig. 1 of the drawings accompanying the present specification as aforesaid, each electrode is accordingly supported beneath, as near as practicable to its inner end, by a trunnioned horizontal roller, 21, preferably molded of suitable fire clay or cement, and burned or baked; said roller having bearings of like or other suitable material in the floor of the embrasure, 22, in the furnace body *a* through which the electrode extends inward.

For closing the coincident opening, 23, in the furnace shell *b*, around each electrode, against the entrance of air and the escape of gas, and so as to provide if desired for the transmission of the electric current by the same means, a rectangular metallic collar *a'*, is employed including a frame, 24, Fig. 1, fixedly attached to the furnace shell *b* and insulated therefrom, and provided internally with movable sections, 25, adapted to maintain the required contacts with the several side of the electrode, with the frame and with each other under different adjustments, together with means for retracting such sections to free the electrodes, represented, in Fig. 1, in the form of screws, 26, parallel with the electrode.

Above accessories of the electrode and furnace form no part of the present invention,

and are more fully set forth in said companion specification.

Provision is made by the present invention for building up and feeding in such horizontal electrodes, *t*, as large and heavy as
5 may be required for any furnace. Such means include endwise movable molds, *b'*, adapted to be used in the building up operation and also for feeding the electrodes
10 through said electrode collars *a'*. Each of these molds, *b'*, includes a horizontal platform, 53, and relatively removable side and top members, 54 and 55, together with transverse clamps, 56, provided with jack screws,
15 58 and 59, which are perpendicular to said side and top members respectively when the latter are in place as in Figs. 1, 5 and 6. The mold *b'* is conveniently mounted on car wheels, 60, 61, having axles transverse to
20 the mold and to the electrode, which run on rails, 62, beneath the electrode, leading to the adjacent side of the furnace and supported by a suitably insulated floor, *c'*. This floor also supports, in suitable bearings, 63, Fig. 6, a horizontal shaft, 64, carrying
25 a pinion, 65, between said rails, which is in mesh with a rack, 66, on the bottom of the mold platform 53. Suitable means for rotating such shaft may consist of worm gearing, 67, Fig. 6, connecting it with the shaft
30 68 of a small electric motor, *d'*, or its equivalent. The mold *b'* moves bodily forward with the electrode in the feeding operation. It is shown in Fig. 1 as it appears immediately after having been closed and before
35 moving it to any appreciable extent. After the mold is moved in successive feeding operations until its rear wheels 61 reach said feed shaft 64, as in Fig. 5, the mold is taken
40 apart by removing said clamps 56 and removable members 54 and 55, as in Fig. 7, and the operation of building the electrode is resumed.

The specific electrode represented as a whole at *t* as aforesaid is composed of a
45 large number of relatively small units, 69, 70, Figs. 2 and 3, rectangular in cross section, including a central tubular unit, 70, to form a passage 52 for the introduction of
50 oxidizing material. This tubular unit 70 is preferably and conveniently composed of relatively short sections, 70', Fig. 4, of fire clay or the like, so as to be noncombustible and at the same time adapted to be kept
55 open by the sloughing off which occurs at the inner end of the electrode. The other units, 69, are of suitable electrode carbon.

In building up the electrode, the platform 53 of the mold *b'* having been exposed and
60 properly located for this operation, the units are built up thereon layer by layer; care being taken to have the sections or lengths of the carbon units 69 break joint longitudinally as at the right in Figs. 1, 5 and 7;
65 and a suitable carbon cement, which may be

composed of ground carbon and molasses, is spread between the layers as the work progresses. The operation proceeds in this manner until a sufficient length has been built up to fill or refill the mold *b'*. The side
70 and top pieces 54 and 55 of the mold *b'* are then applied, being first loosely held in place by the retracted jack screws of the clamps 56, and ultimately brought together and to gage, as in Fig. 6, by tightening the jack screws 58
75 and 59 in proper order so as to render the electrode rectangular and of the required dimensions. The mold *b'* is now ready to be used in the feeding operation, as above described, and when it has again reached the position represented in Fig. 5 it is again retracted and the building operation resumed,
80 and so on indefinitely.

It is of course necessary to stop the current for renewing the electrodes, but this involves very little delay in working the furnace as compared with the withdrawing and replacing of horizontal electrodes as heretofore constructed.

It will be understood that in carrying this invention into effect, the electrode may be built up with or without a tubular unit, and with more or less numerous carbon units; and other like modifications will suggest themselves to those skilled in the art.

The combination and arrangement of parts, including the electrode collar *a'*, represented by Fig. 1, and the provision of the electrode *t* with a tubular unit, as represented by Figs. 2, 3 and 4, are claimed in
100 said companion specification forming part of said allowed application for patent, (Serial No. 570,836) and are hereby disclaimed as forming no part of the present invention.

Having thus described said improvement,
105 I claim as my invention, and desire to patent under this specification:

1. The within described method of building up a stemless electrode, rectangular in cross section, composed of relatively small
110 rectangular units breaking joint longitudinally, which method consists in building a given length upon an endwise movable support layer upon layer, interposing a suitable cement between the units, compressing the
115 electrode to gage by lateral and vertical pressure, freeing and retracting the support, repeating the building up and compressing operation, and so on.

2. The within described method of building up and feeding in a stemless electrode, rectangular in cross section, composed of
120 relatively small rectangular units breaking joint longitudinally, which method consists of building a given length *in situ* upon an endwise movable support layer upon layer, interposing a suitable cement between the
125 units, compressing the electrode to gage by lateral and vertical pressure, feeding the same in endwise, freeing and retracting the
130

support, repeating the building up and compressing operation, again feeding in; and so on, alternately.

3. The within described method of building up and feeding in a stemless electrode, rectangular in cross section, composed of relatively small rectangular units breaking joint longitudinally, which method consists of building a given length *in situ* upon an endwise movable support layer upon layer, interposing a suitable cement between the units, compressing the electrode to gage by lateral and vertical pressure, feeding the same in endwise under such pressure, freeing and retracting the support, repeating the building up and compressing operation, again feeding in; and so on, alternately.

4. Apparatus for use in building up an electrode composed of relatively small units breaking joint longitudinally and cemented and compressed into a practically homogeneous mass; such apparatus comprising an endwise movable mold having an electrode support, relatively removable side and top members, and transverse clamps provided with compressing means which interact with said side and top members.

5. Apparatus for use in building up an electrode composed of relatively small units breaking joint longitudinally and cemented and compressed into a practically homogeneous mass; such apparatus comprising an endwise movable mold having an electrode support, relatively removable side and top

members, and transverse clamps provided with jack screws perpendicular to said side and top member respectively.

6. Apparatus for use in alternately building up *in situ* and feeding in under pressure an electrode composed of relatively small units breaking joint longitudinally and cemented and compressed into a practically homogeneous mass; such apparatus comprising an endwise movable mold having an electrode support provided on its bottom with car wheels, a subjacent track fitted to said wheels and mechanism for propelling the mold back and forth on said track.

7. Apparatus for use in alternately building up *in situ* and feeding in under pressure an electrode composed of relatively small units breaking joint longitudinally and cemented and compressed into a practically homogeneous mass; such apparatus comprising an endwise movable mold having an electrode support provided on its bottom with car wheels and a fixedly attached longitudinal rack, a subjacent track fitted to said wheels, and propelling mechanism including a pinion in mesh with said rack, a motor, and worm gearing transmitting motion from said motor to said pinion; substantially as hereinbefore specified.

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