

July 14, 1942.

F. W. BROOKE

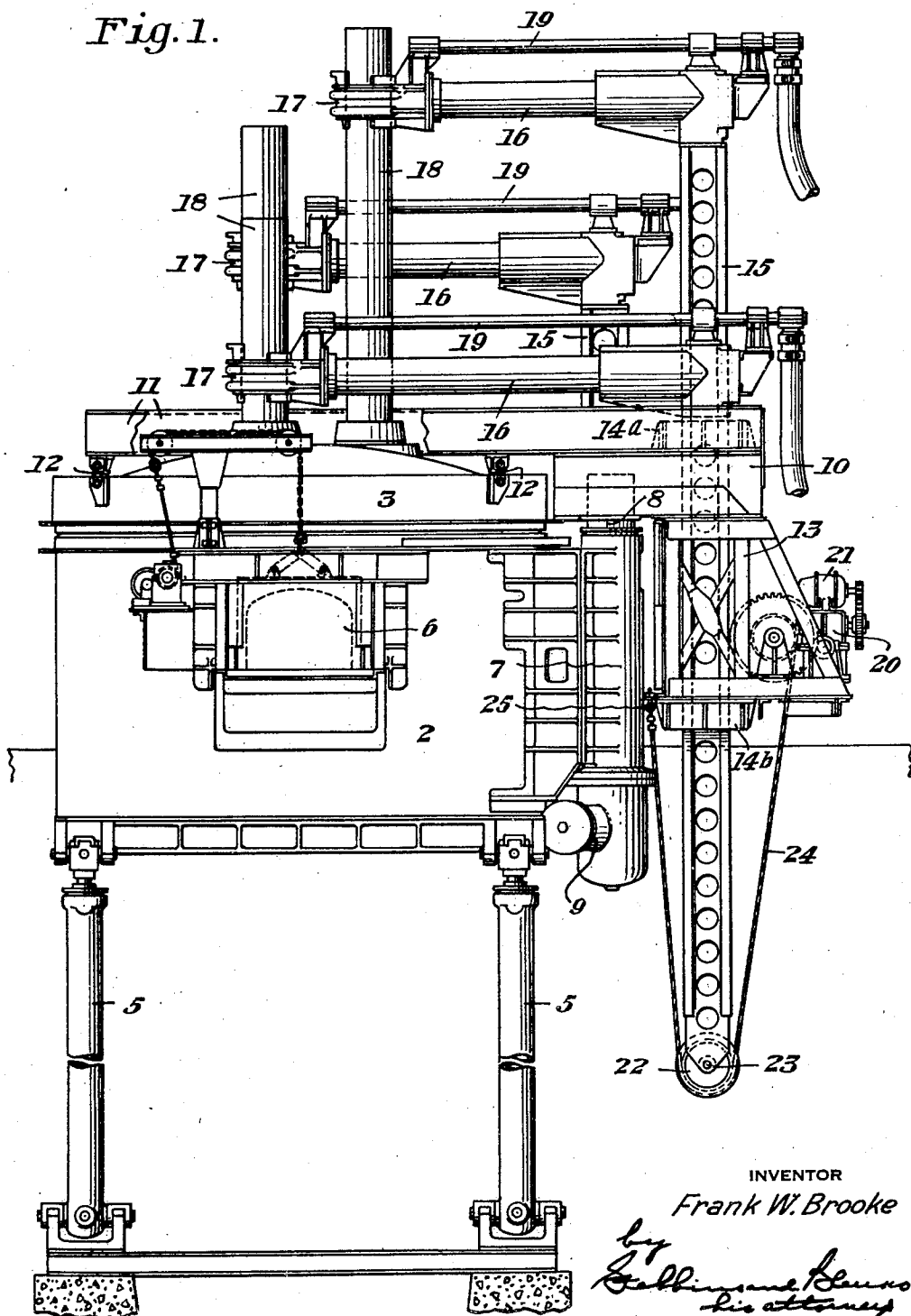
2,290,029

ELECTRIC FURNACE STRUCTURE

Filed March 1, 1941

3 Sheets-Sheet 1

Fig. 1.



July 14, 1942.

F. W. BROOKE

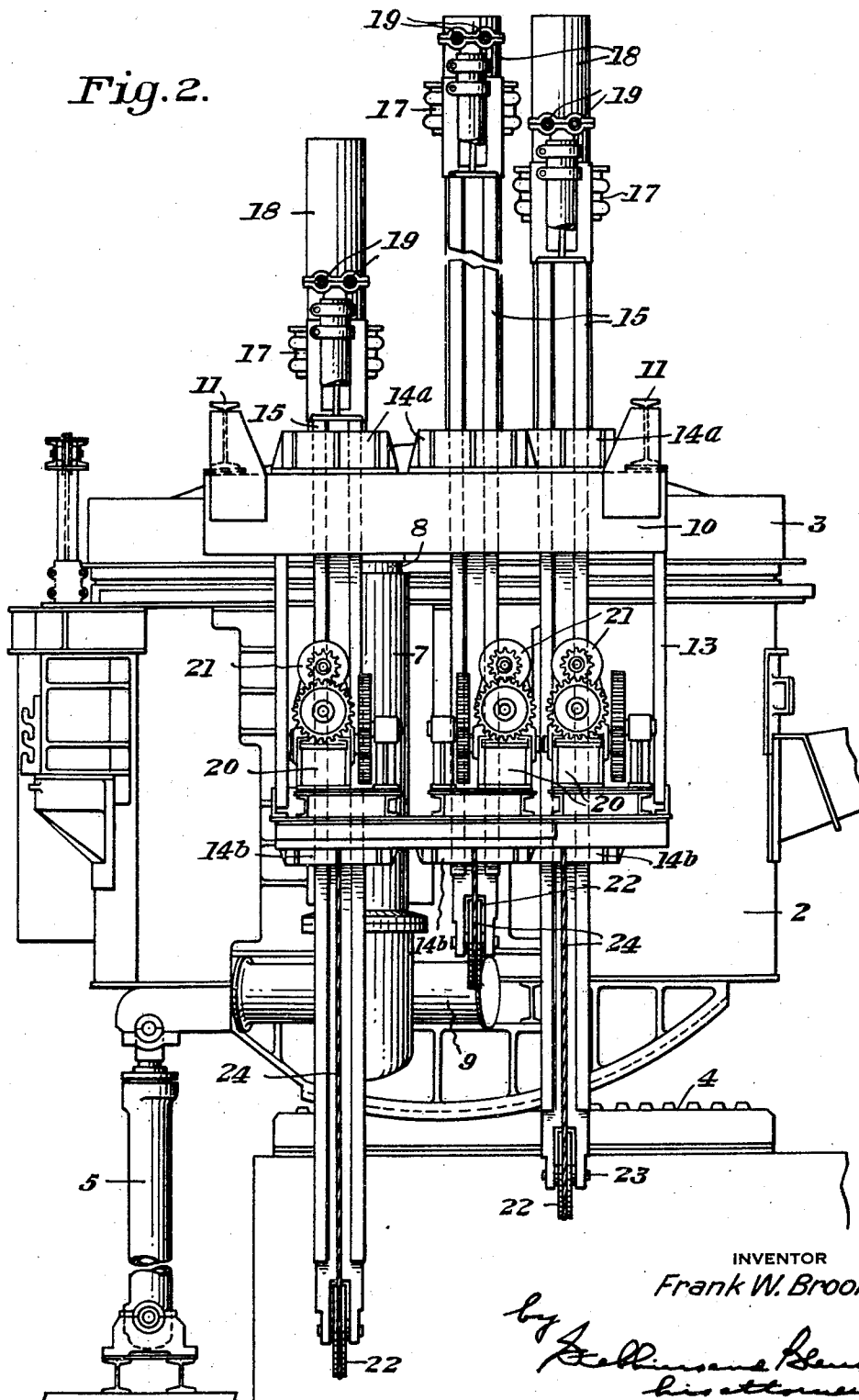
2,290,029

ELECTRIC FURNACE STRUCTURE

Filed March 1, 1941

3 Sheets-Sheet 2

Fig. 2.



July 14, 1942.

F. W. BROOKE

2,290,029

ELECTRIC FURNACE STRUCTURE

Filed March 1, 1941

3 Sheets-Sheet 3

Fig. 3.

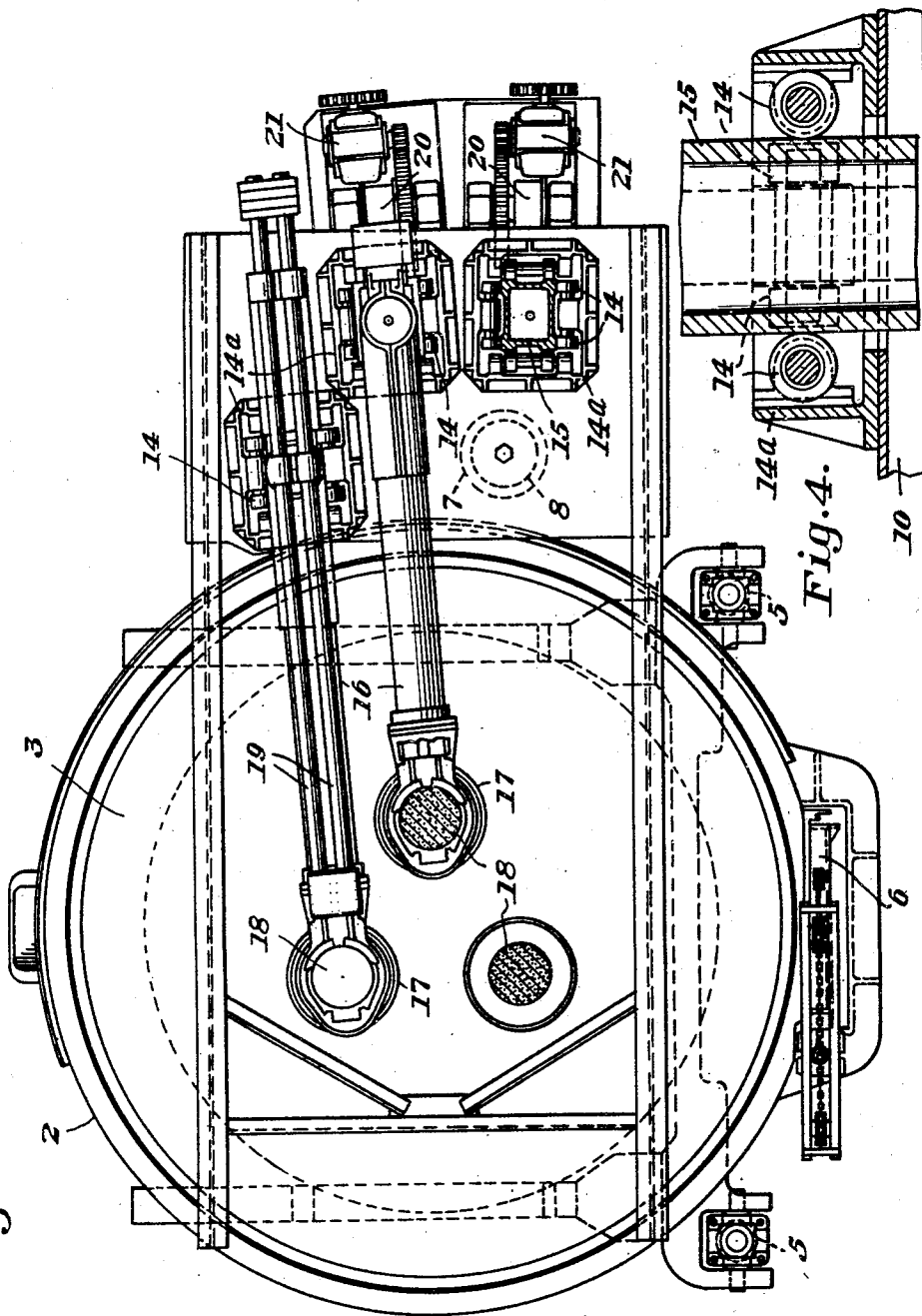


Fig. 4.

INVENTOR

Frank W. Brooke

by *Edmund and Sons*
his attorney

UNITED STATES PATENT OFFICE

2,290,029

ELECTRIC FURNACE STRUCTURE

Frank W. Brooke, Pittsburgh, Pa., assignor to
Swindell-Dressler Corporation, Pittsburgh, Pa.,
a corporation of Pennsylvania

Application March 1, 1941, Serial No. 381,277

13 Claims. (Cl. 13—9)

This invention relates to electric furnace structure and has to do with certain improvements in electric furnaces whereby furnace operation is improved and furnace life lengthened. The invention has to do primarily with the means upon which the electrodes are mounted and through which operative movements are imparted to the electrodes.

Electric furnaces create intense heat which adversely affects the furnace parts. Among the parts which are readily adversely affected are the means for imparting operative movements to the electrodes,—that is, for feeding the electrodes toward and from the charge in response to the control mechanism customarily provided. Such means ordinarily comprises a movable electrode mounting, a winch and cable connected between the winch and the electrode mounting for moving the mounting. The winch is subject to rapid deterioration and various proposals have heretofore been made for protecting it from the furnace heat. Likewise, when an electrode arm which is movable upon a stationary mast is employed the connection between the arm and mast which is in the zone of greatest heat is readily subject to the adverse effects of the furnace heat.

I have devised an electric furnace structure in which virtually all movable parts are disposed laterally of the furnace body rather than superimposed thereupon and are otherwise protected to the maximum extent from the furnace heat. It is to be borne in mind that when the furnace roof is open a very high heat emanates from the top of the furnace body. This heat is detrimental to any movable parts which may be disposed above the furnace. I preferably mount the electrode operating winches laterally of the furnace and below the level of the top of the furnace body. I preferably provide a mounting disposed laterally of the furnace and mount therein vertically movable masts carrying fixed electrode arms so that the points of movable connection between the masts and the supporting mechanism are mainly or wholly below the level of the top of the furnace body and disposed laterally of the furnace. I also preferably provide for protecting the winches by disposing other means serving a dual operating and protective function between the winches and the furnace body. When the roof is mounted upon a pivot at the side of the furnace for laterally swinging movement the pivot is preferably interposed between the body of the furnace and one of the winches which at the same time is disposed below the level of the top of the body. Also the correspond-

ing mast is preferably interposed between the winch and the furnace body. Thus such winch is afforded a maximum of protection from the furnace heat both by reason of its peculiar position and by reason of the interposition between it and the body of other devices which are in the direct path of the furnace heat. Also I prefer to provide connections between the winches and the vertically movable masts which are disposed entirely below the level of the top of the furnace body. My structure results in a furnace having extremely long life and which is exceptionally reliable in operation.

Heretofore in electric furnaces of the type having a roof laterally swingable to open the furnace at the top for charging the roof has been supported mainly from an edge portion thereof upon a casting mounted on the pivot about which the roof swings. Thus the roof or the portion thereof which closes the furnace is mounted somewhat in cantilever fashion and the roof refractories and the steel ring which retains them have consequently been subjected to severe stresses which have considerably shortened the useful life of the roof. I provide for freely supporting the furnace closing portion of the roof in such a way that it is free independently to expand and contract due to temperature changes and also to adjust itself accurately to the body of the furnace when applied thereto to close the furnace. Preferably the furnace closing portion of the roof is supported from the supporting or carrying portion by means disposed about a vertical line passing through the center of gravity of the furnace closing portion. In a preferred structure the furnace closing portion of the roof is freely suspended at a number of points spaced around its periphery so that the stresses to which it is subjected are greatly reduced and its useful life is correspondingly lengthened. Expansion and contraction of the roof without restraint under the influence of temperature changes is permitted.

The roof of an electric furnace is subjected to high temperatures existing within the furnace. Such temperatures cause the roof refractories to soften at their inner faces and wear away rapidly. This requires frequent replacement of the roof, which is ordinarily accomplished by removing the eroded roof from the furnace and substituting for it a new roof which has been previously assembled within its steel retaining ring. In furnaces as heretofore constructed this removal of the old roof and application of the new has been accomplished only with considerable difficulty because of the manner in which the roof has been

held by the supporting casting. In my improved construction this change is accomplished readily and with great saving of time and labor. The furnace closing portion of the roof is simply freed from the supporting beams by disengaging the links which suspend it. By means of the mechanism which ordinarily raises and swings aside the furnace closing portion of the roof for charging purposes the supporting beams and all superstructure are raised and swung aside, leaving the furnace closing portion of the roof in place upon the furnace body from which it can be readily removed by a crane. By a reversal of this process the new roof is readily placed upon the furnace and connected to the supporting beams.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawings I have shown a present preferred embodiment of the invention, in which

Figure 1 is an elevational view with portions cut away of an electric furnace structure;

Figure 2 is an elevational view with portions cut away and to enlarged scale of the structure shown in Figure 1, but viewing the furnace from the right-hand side of Figure 1;

Figure 3 is a view partly in plan and partly in horizontal cross section through the furnace structure shown in Figures 1 and 2 and with portions omitted to enable a clearer showing of other portions; and

Figure 4 is a vertical cross-sectional detail view to enlarged scale showing one of the groups of positioning and guiding rollers for positioning and guiding a mast and the support for such group of rollers.

Referring now more particularly to the drawings, there is shown an electric furnace comprising a body 2 and a roof 3. The furnace body may be of more or less standard construction, being tiltable upon tracks 4 by any suitable mechanism, such, for example, as hydraulic cylinders 5. The usual liftable side door 6 is provided, which door may be operated in any convenient manner.

Pastened to the side of the body 2 is a vertical cylinder 7 within which is disposed a roof supporting piston 8. Suitable fluid connections are provided, as well known in the art, for raising and lowering the piston 8 in the cylinder 7. Also a transverse cylinder 9 is provided within which is disposed a piston operated by known means for turning the piston 8 in the cylinder 7. Consequently by suitable operation of the control mechanism the piston 8 may be raised in the cylinder 7 and also turned about its axis. This structure is already known in the art.

Carried upon the upper end of the piston 8 is a roof support or carrying roof portion 10. Connected with the roof support and extending laterally therefrom over top the furnace are beams 11, from which the roof proper or furnace closing roof portion 3 is suspended by links 12. In the structure shown there are four links 12 positioned equidistantly about the periphery of the roof portion 3. They are disposed about a vertical line passing through the center of gravity of the portion 3. The roof support 10 also has a downward extension or frame 13. Carried by the roof support 10 and frame 11 are three sets of positioning and guiding rollers 14 for positioning and guiding for vertical movement three masts 15, respectively. Each set of rollers

14 consists of an upper group of rollers carried in a support 14a and a lower group of rollers carried in a support 14b. Each mast 15 has connected to it at its top, preferably permanently, an electrode arm 16 which extends over the furnace and carries at its extremity an electrode holder 17 in which is held a generally vertically extending electrode 18. Each of the three electrodes passes downwardly through a suitable opening in the roof 3 as well known in the art. Current to each electrode is supplied through a conductor 19.

Mounted on the frame 13 are three winches 20, one corresponding to each mast 15. As will be noted from Figure 3, each mast is interposed between the corresponding winch and the furnace body when the roof is closed, which is the normal position of the roof. Also the cylinder 7 is interposed between the furnace body and the lower winch shown in Figure 3. Moreover, the winches are disposed so that they are at all times entirely below the level of the top of the furnace body in addition to being spaced quite a substantial distance away from the furnace body. They are thus afforded the maximum of protection from the furnace heat. Each winch is driven by an electric motor 21 mounted atop the winch. The winch structure per se may be standard.

Each mast 15 has a sheave 22 pivoted thereto at 23 at its bottom. Each winch 20 has a cable 24 wound on the winch drum and extending therefrom generally downwardly and about the bottom of the sheave 22 of the corresponding mast 15 and thence extending generally upward and being dead-ended to an eye 25 held in the frame 13.

Each mast 15 is supported solely by the corresponding cable 24. It is merely guided by the guide rollers 14 which maintain it in vertical position and facilitate its movement. Upon operation of a winch to wind up on its drum the cable 24 connected therewith the corresponding mast 15 is raised which results in corresponding raising of the electrode 18 carried by the arm 16 fast to that particular mast. Conversely, when a winch pays out its cable 24 this allows the corresponding mast 15 to move downwardly due to gravity and the electrode carried thereby moves therewith. There are no moving parts other than the unit comprising the relatively fixed members 15 to 19, inclusive, above the body of the furnace. The winches and their cables and the connections with the masts are all far below the top of the furnace body. The guides for the masts are disposed laterally of the furnace body and are out of the zone of greatest heat. The winches are also protected from the furnace heat by being removed a substantial distance from the furnace and also by having the masts 15 and, in the case of one winch, the cylinder 7 interposed between them and the furnace body. The furnace is exceptionally sturdy and foolproof and the repairs and adjustments ordinarily necessary to moving parts are virtually eliminated.

While I have shown and described a present preferred embodiment of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. Electric furnace structure comprising a furnace body, a roof for the body, means for swing-

ing the roof laterally in opening and closing movements, an electrode carried by the roof and means also carried by the roof for imparting operative movements to the electrode, said means including a motive unit disposed at all times below the level of the top of the body.

2. Electric furnace structure comprising a furnace body, a roof for the body, means for moving the roof generally vertically and swinging it laterally in opening and closing movements, an electrode carried by the roof and means also carried by the roof for imparting operative movements to the electrode, said means including a motive unit disposed below the level of the top of the body when the roof is in its highest position.

3. Electric furnace structure comprising a furnace body, a roof for the body, means for swinging the roof laterally in opening and closing movements, an electrode and means for imparting operative movements to the electrode, said means including a mast carried by the roof and generally vertically movable relatively thereto, an electrode holder carried by the mast and means for raising and lowering the mast relatively to the roof.

4. Electric furnace structure comprising a furnace body, a roof for the body, means for swinging the roof laterally in opening and closing movements, an electrode and means for imparting operative movements to the electrode, said means including a mast generally vertically movable to impart such movements to the electrode, an electrode holder carried by the mast, a motive unit and connections between the motive unit and mast for generally vertically moving the mast, said connections being disposed below the level of the top of the body.

5. Electric furnace structure comprising a furnace body, an openable roof for the body, an electrode and means for imparting operative movements to the electrode, said means including a mast carried by the roof and generally vertically movable relatively thereto, an electrode holder carried by the mast and means including a motive unit carried by the roof below the level of the top of the body for raising and lowering the mast relatively to the roof.

6. Electric furnace structure comprising a furnace body, a roof for the body, an electrode and means for imparting operative movements to the electrode, said means including a motive unit carried by the roof and disposed below the level of the top of the body.

7. Electric furnace structure comprising a furnace body, a roof for the body, an electrode, means for imparting operative movements to the electrode, said means including a motive unit carried by the roof and disposed below the level of the top of the body, and means interposed between the body and motive unit shielding the motive unit from the heat of the body.

8. Electric furnace structure comprising a furnace body, a roof for the body, means for swinging the roof laterally in opening and closing movements, an electrode, a vertically movable mast, an electrode holder carried by the mast for holding the electrode, a motive unit disposed below the level of the top of the furnace body and connections between the motive unit and mast whereby the former operates the latter for im-

parting operative movements to the electrode, the mast being normally interposed between the furnace body and the motive unit.

9. Electric furnace structure comprising a furnace body, a roof, a pivot connected with the body upon which the roof is mounted and about the axis of which the roof is swingable relatively to the body in opening and closing movements, an electrode and means for imparting operative movements to the electrode, said means including a mast carried by the roof and generally vertically movable relatively thereto and a motive unit operatively connected with the mast for raising and lowering the same, the pivot being normally interposed between the furnace body and the motive unit.

10. Electric furnace structure comprising a furnace body, a roof, a pivot connected with the body upon which the roof is mounted and about the axis of which the roof is swingable relatively to the body in opening and closing movements, an electrode and means for imparting operative movements to the electrode, said means including a mast carried by the roof and generally vertically movable relatively thereto and a motive unit operatively connected with the mast for raising and lowering the same, the pivot and mast being normally interposed between the furnace body and the motive unit.

11. Electric furnace structure comprising a furnace body, a roof for the body, the roof having a generally downwardly projecting portion disposed laterally of the body, an electrode, a vertically movable mast passing through and guided by said portion, an electrode holder carried by the mast for holding the electrode, a motive unit carried by said portion and connections between the motive unit and the mast for raising and lowering the mast.

12. Electric furnace structure comprising a furnace body, a roof for the body, the roof having a generally downwardly projecting portion disposed laterally of the body, an electrode, a vertically movable mast passing through and guided by said portion, an electrode holder carried by the mast for holding the electrode, a winch carried by said portion and a cable connected with the winch and extending generally downwardly therefrom and connected with the mast at the lower portion thereof for raising and lowering the mast.

13. Electric furnace structure comprising a furnace body, a roof, a pivot connected with the body, the roof having a generally downwardly projecting portion the lower part of which is disposed laterally of the body, the roof being mounted on the pivot through a part of said portion whereby the roof is swingable relatively to the body in opening and closing movements, an electrode, a vertically movable mast passing through and guided by said portion, an electrode holder carried by the mast for holding the electrode, a winch carried by said portion below the level of the top of the body and a cable connected with the winch and extending generally downwardly therefrom and connected with the mast at the lower portion thereof for raising and lowering the mast, the pivot being normally interposed between the furnace body and the winch.

FRANK W. BROOKE.