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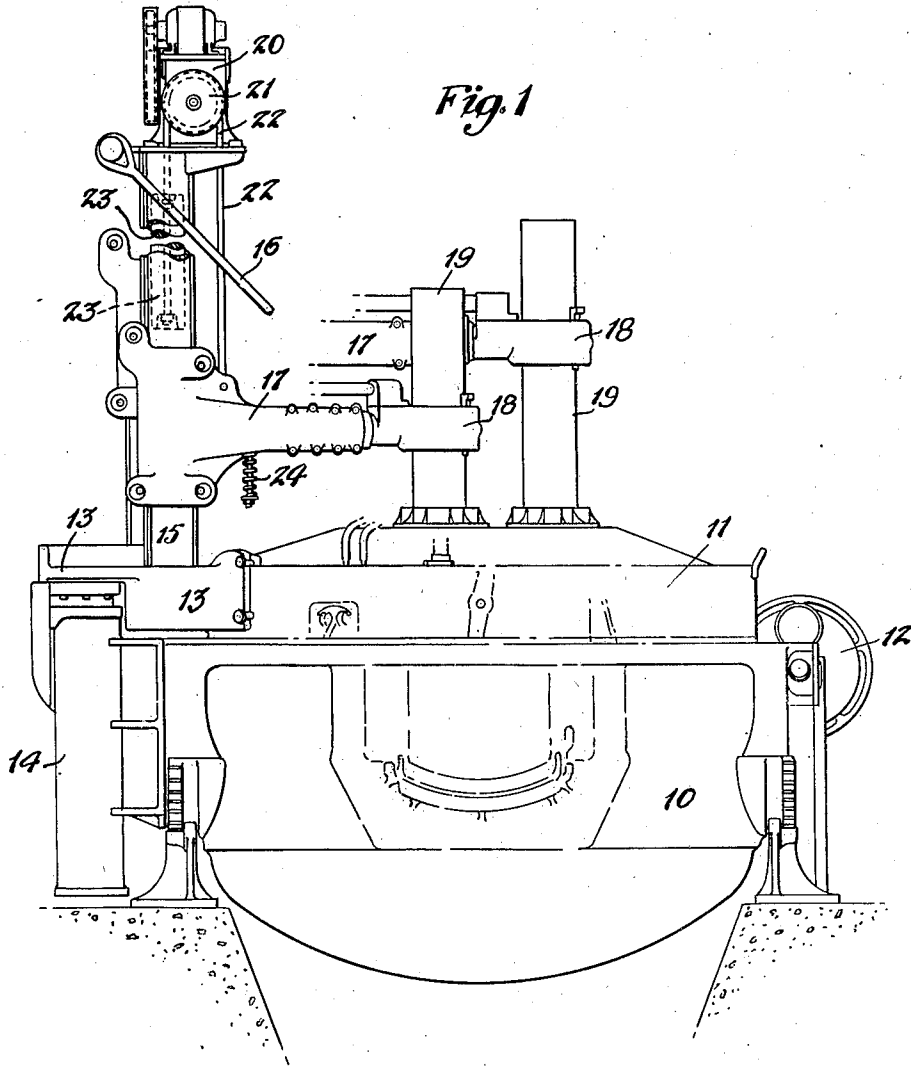
W. E. MOORE

2,046,085

ELECTRIC FURNACE

Original Filed Dec. 22, 1933

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

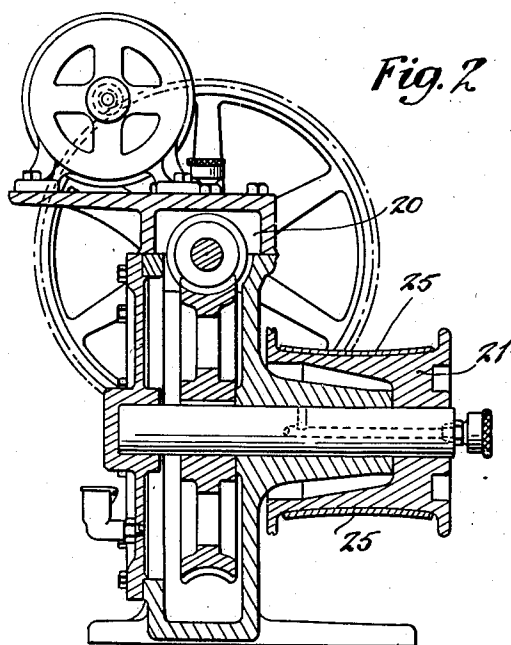


Fig. 3

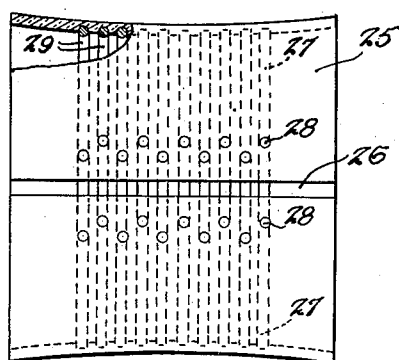
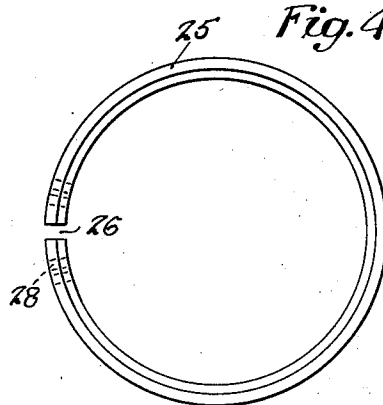


Fig. 4



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UNITED STATES PATENT OFFICE

2,046,085

ELECTRIC FURNACE

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Original application December 22, 1933, Serial
No. 703,639. Divided and this application
November 1, 1934, Serial No. 751,042

16 Claims. (Cl. 13—14)

My invention relates to improvements in electric furnaces and more particularly to furnaces of the type used in metallurgical operations.

An important object of my invention is to provide novel electrode operating mechanism for electric metallurgical furnaces.

Another object of my invention is the provision of electrode operating mechanism especially adapted for use with tilting furnaces of the removable roof type.

A further object of my invention is to provide a novel winding drum for the electrode operating cables.

Other objects and advantages of my invention will be apparent during the course of the following description.

The present application is a division of my co-pending application serial No. 703,639 filed December 22, 1933.

In the accompanying drawings which form a part of this specification, and wherein like characters of reference denote like parts throughout the same,

Figure 1 is an elevation of an electric metallurgical furnace embodying my invention,

Figure 2 is a vertical sectional view of the electrode operating winch,

Figure 3 is a side elevation of the winch drum bushing, parts being broken away, and,

Figure 4 is an end elevation thereof.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of my invention, the numeral 10 designates the shell of a tilting electric metallurgical furnace having a removable roof 11. Tilting of the furnace shell is effected by means of tilting mechanism 12. A spectacle casting 13 is detachably secured to roof 11 and is adapted to be engaged by a suitable lifting ram 14 for raising the spectacle casting and roof and swinging them away from the furnace shell to permit charging of the furnace shell through its top. The construction of the furnace shell and roof, and the tilting and roof raising mechanism is disclosed in my co-pending application above referred to and will not be described in detail.

The electrode guide columns 15 are mounted upon spectacle casting 13 and are braced by rods 16. The electrode arms 17 are slidably mounted on columns 15 and have suitable clamps 18 which engage the electrodes 19 which extend through openings in the top of the furnace. As the columns and electrodes are supported by the spectacle casting 13 they are moved with the roof or

rising structure when the roof is removed for charging the furnace.

It has heretofore been customary to mount the winches, for adjusting the electrode arms vertically on the columns, at a point spaced a substantial distance from the furnace, or directly upon the furnace shell. Either of these locations is disadvantageous with a removable roof or tilting furnace, because of the lift on the electrode arms when the rising swing-aside structure is moved independently of the winches and I therefore propose to mount these winches upon some convenient place on the rising structure, as for instance the top of the electrode supporting columns as shown in Figure 1. The electrode operating winches 20 may be of the usual motor driven construction such as shown in Figure 2 with metal winding drums 21 upon which the electrode operating cables 22 are wound. One end of each cable is attached to the cross head of one of the electrode arms 17 while the other end of each cable is attached to a counter-balance weight 23 arranged to slide in the hollow columns 15. Spring buffers 24 are arranged on the bottoms of the electrode arms and in the lower position of the arms contact with the furnace roof or spectacle casting, allowing the cables 22 to slacken. In the upper position of the electrode arms the counter-balance weights 23 ground at the bottom of the columns 15 and permit slackening of the cables.

The cables 22 are preferably of steel and if they are allowed to contact directly with the metal drums 21, considerable wear on the drums and cables will result. In order to prevent this wear and at the same time permit rotation of the drums without a corresponding movement of the cables I provide a flexible sleeve 25 of fiber or other suitable material adapted to fit over each drum 21. Each sleeve 25 is slit longitudinally at 26 as seen in Figures 3 and 4, and its inner surface is provided with a plurality of circumferentially extending grooves 27 which terminate in radial openings 28 at points adjacent but spaced from the longitudinal slit 26. Rings or bands 29 of spring wire fit into the grooves 27 and have their ends arranged in openings 28. It will be seen that the spring wires 29 tend to expand or open the split sleeve 25.

The sleeve 25 is dished inwardly slightly to conform to the shape of the drum 21 about which it is to be arranged. While the sleeves 25 may be formed in any suitable manner, they can be formed from a rectangular strip of fiber or other material properly grooved and then bent into a

generally cylindrical shape and set in this position.

In practice the split sleeve is arranged about the drum 21 as shown in Figure 2 and the electrode operating cable is wound about the sleeve and drum. Normally the weight of the counterbalances 23 and electrode arms 17 on cables 22 compresses the fiber bushings on drums 21 against the tension of springs 29 so that the sleeves will rotate with the drums to raise or lower the electrode arms. When the weights 23 ground at the bottom of columns 15 or on suitable stops therein, or when the electrode arms contact with the roof or rising structure of the furnace through spring buffers 24, the weight on cables 22 is relieved, thereby allowing springs 29 to expand sleeves 25 and permit drums 21 to rotate within the split sleeves. Consequently limit switches to prevent stalling of the winch motors are not required.

As the entire electrode operating mechanism, including the winches, is mounted upon the furnace roof or rising structure, it may be moved with the roof as a unit and will not interfere with movement of the furnace roof. The furnace may be tilted, or the furnace roof may be raised and moved away from the furnace shell without interference from the electrode operating mechanism.

In the claims, the terms "furnace roof", "removable furnace roof" and "roof" are used to designate the entire rising swing-aside structure including the furnace roof ring and the spectacle casting 13 which supports the electrode guide columns 15.

While I have shown and described the preferred embodiment of my invention, it is to be understood that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the subjoined claims.

Having thus described my invention what I desire to claim and protect by Letters Patent is:

1. An electric furnace comprising a furnace shell, a removable roof detachably secured thereto, hollow columns on said roof, electrode arms slidably supported on said columns, electric winches supported by said columns and having drums operated thereby, cables wound about said drums, each cable being secured at one end to an electrode arm and having its other end extending down into one of the columns, and a counterbalance weight slidably arranged within each column and secured to the cable extending into said column.

2. An electric furnace comprising a furnace shell, a removable roof detachably secured thereto, hollow columns on said roof, electrode arms movably supported on said columns, electric winches supported by said columns and having drums operated thereby, cables wound about said drums, each of said cables being secured at one end to an electrode arm and having its other end extending down into one of the columns, a counterbalance weight slidably arranged within each column and secured to the cable extending into said column, and means operated by the weight of the electrode arms and counterbalance weights to maintain the cables in operative engagement with the drums.

3. An electric furnace comprising a furnace shell, a roof detachably secured thereto, columns on said roof, electrode arms slidably supported on said columns, electric winches supported by said roof and operatively connected to said elec-

trode arms to raise and lower the arms on the columns, and means to disconnect the electrode arms and winches when the electrode arms reach their upper and lower limits of travel on the columns.

4. An electric furnace comprising a furnace shell, a roof secured thereto, columns on said roof, electrode arms slidably supported on said columns, winches supported by the columns and having winding drums, cables secured to the electrode arms and wound about said drums, whereby rotation of the drums will adjust the position of the electrode arms on the columns, and means interposed between the winding drums and cables to disconnect the drums and cables when the electrode arms are moved to their upper or lower limits of travel.

5. An electric furnace comprising a furnace shell, a roof secured thereto, columns on said roof, electrode arms slidably supported on said columns, winches supported by the furnace roof and having winding drums, sleeves arranged about said drums, and cables connected to said electrode arms and wound about said sleeves, whereby operation of said winches will adjust the position of the electrode arms on the columns.

6. An electric furnace comprising a furnace shell, a roof secured thereto, columns on said roof, electrode arms slidably supported on the columns, electric winches supported by the roof and having winding drums, split sleeves arranged about said drums, and cables secured to said electrode arms and wound about the split sleeves on the drums.

7. An electric furnace comprising a furnace shell, a roof secured thereto, columns on said roof, electrode arms slidably supported on said columns, electric winches supported by the columns and having winding drums, split sleeves surrounding said drums, resilient members arranged within said sleeves and tending to expand the same, and a cable wound about each sleeve and connected at one end to an electrode arm and at the other end to a counterbalance weight.

8. An electrode operating winch for electric furnaces comprising a winding drum, means to rotate said drum, a fiber sleeve surrounding the drum, and a cable wound about said sleeve and connected to an electrode to raise and lower the same.

9. An electrode operating winch for electric furnaces comprising a winding drum, means to rotate said drum, a split sleeve surrounding said drum, and a cable wound about said sleeve and connected to an electrode to raise and lower the same.

10. An electrode operating winch for electric furnaces comprising a winding drum, means to rotate said drum, a split sleeve surrounding the drum, a resilient member arranged within said sleeve and tending to expand the same, and a cable wound about the sleeve and connected at one end to an electrode and at the other end to a counterbalance weight.

11. An electric furnace comprising a furnace shell, a roof detachably secured thereto, means to raise the roof from the shell and swing it away from the shell, columns on the roof, electrode arms slidably supported on said columns, and electric winches mounted on said roof and operatively connected to said electrode arms to raise and lower the arms on the columns.

12. An electric furnace comprising a furnace shell, a removable roof detachably secured thereto, columns on said roof, electrode arms slidably

supported on said columns, electric winches mounted on the roof and having rotatable drums, cables wound about said drums, each cable being secured at one end to an electrode arm, counterbalance weights connected to the other ends of the cables, and means operated by the weight of the electrode arms and counterbalance weights to maintain the cables in operative engagement with the drums.

10 13. An electric furnace comprising a furnace shell, a roof thereon, hollow columns on said roof, electrode arms slidably supported on said columns, electric winches supported by said columns and having rotatable drums arranged in
15 alignment with the open ends of the hollow columns, cables wound about said drums, each cable being secured at one end to an electrode arm and having its other end extending down into one of the columns, and a counterbalance weight
20 arranged within each column and secured to the cable extending into the column.

25 14. An electric furnace comprising a furnace shell, a roof secured thereto, columns on said roof, electrode arms slidably supported on said columns, power winches supported by said columns and having rotatable drums, cables wound about said drums, each cable being secured at one end to an electrode arm, and counterbalance

weights secured to the other ends of the cables and serving to counterbalance the weight of the electrode arms.

15 15. An electric furnace comprising a furnace shell, a removable roof detachably secured thereto, columns on said roof, electrode arms movably supported on said columns, power winches supported by the columns and having rotatable drums, cables wound about said drums, each of said cables being secured at one end to an electrode arm, counterbalance weights secured to
10 the other ends of the cables and serving to counterbalance the weight of the electrode arms, and means operated by the weight of the electrode arms and counterbalance weights to maintain the cables in operative engagement with
15 the drums.

16. An electrode operating winch for electric furnaces comprising a winding drum, means to rotate said drum, a cable wound about said drum
20 and connected at one end to an electrode to raise and lower the same and at its other end to a counterbalance weight, and means interposed between the drum and cable to disconnect the drum and cable when the electrode is moved to its
25 upper or lower limit of travel.

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