April 7, 1925. 1,532,599

W. E. MOORE

ELECTRIC FURNACE

Original Filed Sept. 5, 1919

Fig. 2.

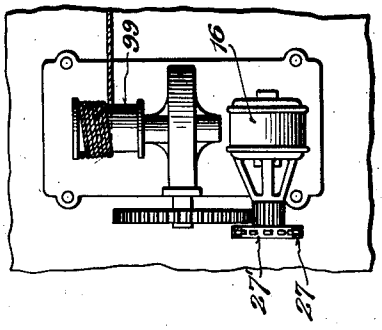


Fig. 1.

Inventor

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UNITED STATES PATENT OFFICE.

WILLIAM E. MOORE, OF BEAVER, PENNSYLVANIA, ASSIGNOR TO PITTSBURGH RESEARCH CORPORATION, A CORPORATION OF DELAWARE.

ELECTRIC FURNACE.

Original application filed September 5, 1919, Serial No. 321,851. Divided and this application filed September 12, 1921. Serial No. 500,137.

To all whom it may concern:

Be it known that I, WILLIAM E. MOORE, a citizen of the United States of America, residing at Beaver, in the county of Beaver and State of Pennsylvania, have invented certain new and useful Improvements in Electric Furnaces, of which the following is a specification.

My invention relates to electric furnaces of the arc type, and more particularly to mechanism for raising and lowering the arcing electrodes.

It has heretofore been proposed to employ hoisting cables and motor driven winding drums for this purpose, the motors being controlled by automatic regulators, and the ends of the cables being attached to the winding drums. Difficulty has been experienced with such apparatus, however, owing to the fact that, should the automatic regulators fail, for any reason, to stop the motors at the proper time, the drums continue to turn, thus causing overwinding of the cables and resulting in serious damage.

The primary object of the present invention is, therefore, to provide an improved hoisting mechanism of the above type, whereby the movement of the electrodes is automatically restricted to definite limits, regardless of whether the motor stops or not. In other words, I propose to render the rotation of the drums ineffective to move the electrodes beyond a certain point, and to this end I contemplate the provision of means to operatively disconnect the cables from their respective winding drums when the predetermined limit of travel has been reached in either direction.

For operating the electrode arms of furnaces of the tilting type when adjusting the arcs as the carbon electrodes wear away, it has heretofore been customary to mount motor winches directly on the furnace shell, engaging racks connected to the electrode arms; or in some cases the motors are geared to vertical screws, which engage the electrode arms. This results in a great deal of complication in and around the furnace shell, which is especially objectionable, on account of the heat, dust and dirt incident to the operation of the electric furnace, thus producing many "burn-outs" in the motors and great wear and tear on the gears. Moreover, due to the tilting action of the furnace, the motor when attached to and tilting with the furnace tends to spill the oil out of its bearings and injure its windings and run its bearings hot.

It has also been heretofore proposed to dispose the motor winches in a pit or the like, below the furnace, but it has been found that under these conditions they are subject to rapid wear and tear, due to the accumulation of ash, slag, etc., and they are especially liable to injury when the furnace bottom "cuts through", and pours its contents of molten metal on and around the motors.

A further object of my invention, therefore, is to overcome all these difficulties, and to this end I provide novel means for operating the electrode arms, in which the winches or winding drums are mounted in the substation wall, where they are protected from the dust and dirt, but are made readily accessible.

This application is a division of application Serial No. 321,851, filed September 5, 1919; Patent No. 1,444,980 of February 13, 1923.

One embodiment of my invention is illustrated in the accompanying drawings, forming a part of this specification, and in which,

Figure 1 is a front view of the furnace and the connections therefor, and

Figure 2 is a sectional plan of the winding mechanism, the section being on the line 2—2 of Figure 1.

In carrying out my invention I provide a suitable base 1, upon which are mounted horizontal supports 2 and 3 for rockers or trunnion frames 4 and 5 respectively. The trunnions are mounted at the sides of the furnace body or crucible so as to permit the furnace to tilt forwardly and backwardly. The means for tilting the furnace consists of a hand wheel 6, connected with suitable operating mechanism, as clearly shown in the above mentioned application, and supported on the floor column 9. The tilting means, it will be noted, is well above the floor, making ready inspection and repair convenient, and being free from all troubles due to dust, dirt, slag, molten metal, etc. The tilting mechanism may be actuated by a motor 13, if desired.

Electrode arm-supporting columns 14 are carried by the trunnion frame 5 and the

electrode arms 15 are movable along the columns to adjust the arcs. For this purpose, I mount motor winches 16 inside the sub-station wall 17, where they are protected from heat, dust and dirt by the sub-station 18 and also by the removable screen or cover 19. The motor winches 16 are connected with the arms 15 by cables 20 which pass underneath the floor 21 around the sheave wheels 22, thence upwardly through the columns 14 to suitable sheaves 23, down around the sheaves 24 and are fastened to the sheave brackets 25. This greatly simplifies the furnace structure and reduces the troubles, delays and costs of the ordinary structure.

As it is sometimes desirable to hoist the electrode arms when no power is available for operating the electrode winches, I also provide a hand crank gear 26, connected by sprockets 27′ and chain 27 to the winches. This has a crank shaft placed at convenient height and the chain 27 is made adjustably taut by eccentric hand crank shaft bearing 28 clamped in housing 29, attached to lintel beams 30, built into the opening of the sub-station wall. The cranks 31, when swung backward, disengage the flattened head on the end of the sprocket shaft 27″, so that the shaft may then revolve freely when turned by the motor without revolving the crank.

The electrode arms are carried on turned pipe columns 14 by means of sleeve-like cross heads 36, guided by anti-friction rollers 37. These sleeves are held in their correct vertical plane by means of feathers 38, attached to the columns, which are engaged by suitable feather ways, not shown, in the cross heads 36.

The buffer spring 96 is arranged to engage a pad or projection 97 attached to the roof frames 80, so that the top of the electrode arm is caught by the spring, and the clamp end of the arm prevented from coming in contact with the electrode gland, irrespective of the height of the roof or the extension of the same, due to heat.

My improved means by which the electrode arms are raised or lowered will be now described. A drum 99 is provided for each cable 20, only one drum being shown. The cables 20, as stated before, pass underneath the floor 21, through a tunnel 39ª for each cable. The cable is wrapped several times around the drum to obtain a friction "bite" and is passed over a pulley 100, and supports a counterbalance weight 101. When the electrode arm has reached its uppermost limit of safe travel, the weight 101 will rest on the floor so that the cable 20 will be slackened and will lose its "bite", thereby allowing the drum to revolve freely inside the coils of the cable without straining or breaking the hoisting mechanism. In like manner, when the spring 96 engages the buttress 97, the cable is slackened, allowing the drum to revolve harmlessly.

I claim:

1. The combination with a tilting electric furnace of mechanism for adjusting electrodes in said furnace, said mechanism comprising motors mounted on a stationary support, drums operated by said motors and operating cables passing from the electrodes to and around said drums and carrying at their ends weights adapted to maintain them in frictional engagement with said drums.

2. An electric furnace having adjustable electrodes, motors, drums operated thereby, automatic regulators for said motors and cables for operating said electrodes, said cables passing to and around said drums, and weights on the ends of said cables adapted to maintain them in frictional engagement with said drums.

3. An electric furnace having adjustable electrodes, motors, drums operated thereby, automatic regulators for said motors and cables for operating said electrodes, said cables passing to and around said drums, weights on the ends of said cables adapted to maintain them in frictional engagement with said drums, and supports for said weights limiting the extent of movement of the cable through which the drum will frictionally engage it to lift the electrode.

4. The combination with an electric furnace having an adjustable electrode, of mechanism for adjusting said electrode comprising a motor mounted on a stationary support, a drum driven by said motor, and an operating cable passing from said electrode to and around said drum, and carrying at its end a weight adapted to maintain the cable in frictional engagement with said drum.

5. The combination with an electric furnace having an adjustable electrode, of mechanism for adjusting said electrode comprising a motor mounted on a stationary support, a drum driven by said motor, and an operating cable passing from said electrode to and around said drum, and supporting a weight at a point beyond said drum, said weight serving to cause the drum to frictionally drive the cable.

6. The combination with an electric furnace having an adjustable electrode, of mechanism for adjusting said electrode comprising a motor mounted on a stationary support, a drum driven by said motor, an operating cable passing from said electrode to and around said drum, a weight supported by said cable at a point beyond the drum, said weight serving to cause the cable to be frictionally driven by the drum, and means for arresting the downward travel of

said weight at a predetermined point, and thus limiting the extent of movement of the cable through which it will be frictionally driven by the drum to lift the electrode.

7. The combination with an electric furnace having an adjustable arcing electrode, of power means for adjusting said electrode, and mechanical means, independent of the furnace structure, for preventing the over-running of the electrode.

8. In an electric furnace of the tilting type, a support, electrode carrying arms slidable on said support, cables for raising and lowering the electrode supporting arms, means for operating the cables, and means for preventing the over-running of the electrode arms.

9. In an electric furnace of the tilting type, a support, electrode carrying arms slidable on said support, cables for raising and lowering the electrode supporting arms, means for operating the cables, and automatic means for preventing the over-running of the electrode arms.

10. The combination with an electric furnace having an adjustable arcing electrode, of means for adjusting said electrode comprising a winding drum, a cable connected to said electrode and coiled around the drum, and a counter-balance weight carried by the cable on the other side of the drum.

11. The combination with an electric furnace having an adjustable arcing electrode, of means for adjusting said electrode comprising a winding drum, a cable connected to said electrode and extending to the drum, means for normally causing the cable to exert a frictional driving grip on the drum, and means for automatically releasing such grip when the electrode reaches the limit of its movement.

12. The combination with an electric furnace having an adjustable arcing electrode, of means for adjusting said electrode comprising a winding drum, a cable connected to said electrode and extending to the drum, means for normally causing the cable to exert a frictional driving grip on the drum, and means for automatically releasing such grip when the electrode reaches the upper or lower limit of its movement.

13. In an electric furnace, a guide column, a pulley carried thereby, an electrode arm arranged to travel on said column, a winding drum, a cable connected with the arm and passing over said pulley, said cable being coiled around the drum, and a counterbalance weight attached to the other end of the cable.

14. In an electric furnace, a guide column, a pulley carried thereby, an electrode arm, a winding drum, a cable connected with the arm and passing over the pulley and extending to the drum, and means for causing the cable to exert a grip on the drum which grip is released automatically when the electrode arm has reached a limit of its movement.

15. In an electric furnace, a guide column, a pulley carried thereby, an electrode arm, a winding drum, a cable connected with the arm and passing over the pulley and extending to the drum, and means for causing the cable to exert a grip on the drum which is released automatically when the electrode arm has reached the upper or lower limit of its movement.

16. In an electric furnace, an electrode arm, a guide column, said arm being slidably mounted on said guide column, an electrode winch spaced from the furnace structure, and a cable secured to the electrode arm at one end and arranged to pass underneath the floor and connected to said winch.

17. The combination with an electric furnace having an arcing electrode, and a transformer for supplying current thereto, of a transformer house adjacent the furnace, a motor driven winch mounted within the wall of the transformer house, and a cable supporting said electrode and operatively connected with said winch.

18. The combination with an electric furnace having an arcing electrode, and a transformer for supplying current thereto, of a motor driven winch, a protective housing in which said motor driven winch is enclosed, and a cable supporting said electrode and operatively connected with said winch.

19. The combination with an electric furnace of the tilting type having an arcing electrode, of a cable by which said electrode is suspended in the furnace, means for tilting the furnace, and means for raising and lowering said electrode comprising a winding drum to which said cable is operatively connected, said winding drum being mounted on a fixed support to one side of and substantially on the same level as the furnace.

In testimony whereof I affix my signature.

WM. E. MOORE.

DISCLAIMER

1,532,599.—*William E. Moore*, Beaver, Pa. ELECTRIC FURNACE. Patent dated April 7, 1925. Disclaimer filed January 14, 1939, by the assignee, *Pittsburgh Research Corporation.*

Hereby enters this disclaimer to claim 19 of said patent.

[*Official Gazette February 14, 1939.*]

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