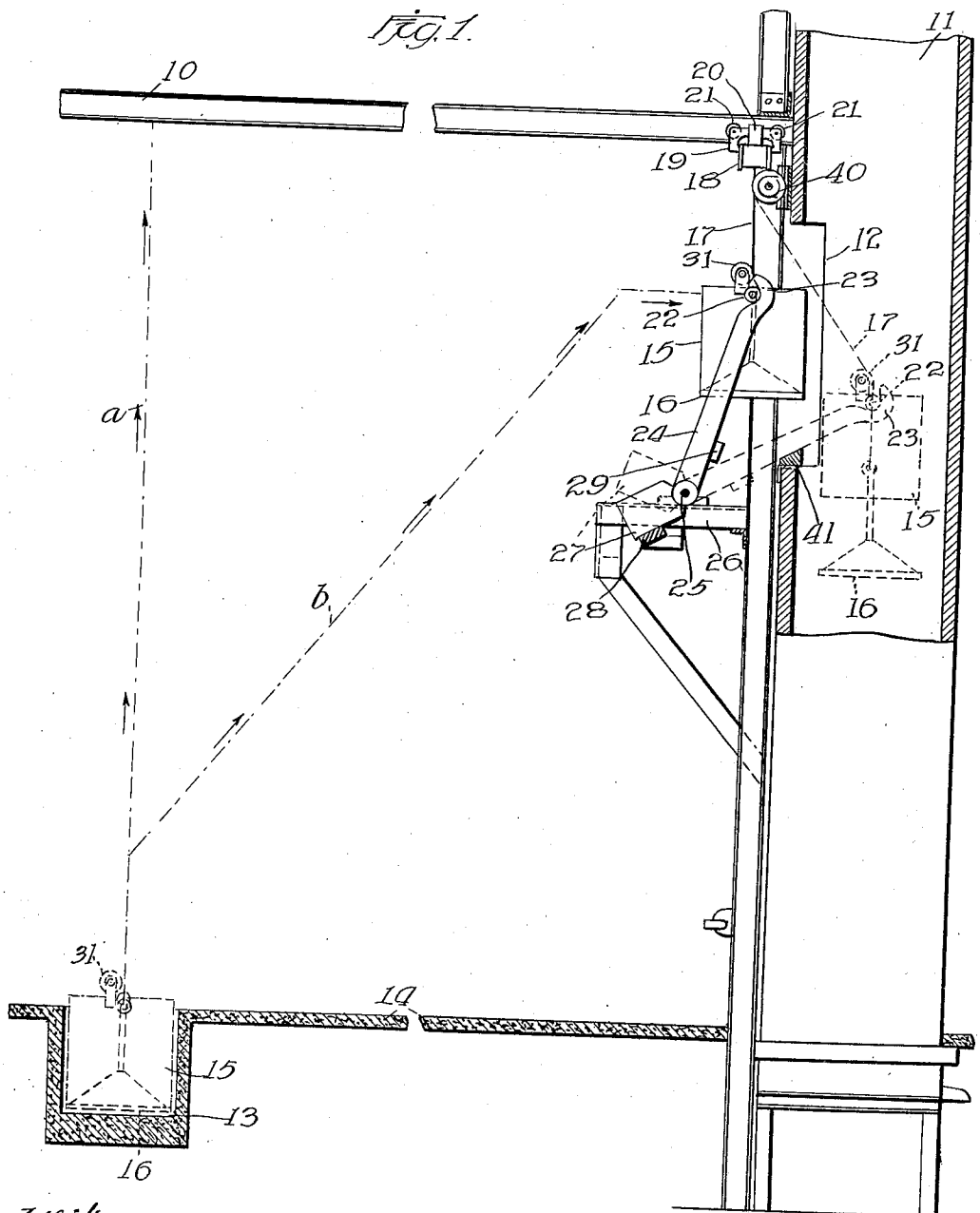
June 4, 1940. J. N. RICHARDSON 2,203,307

FURNACE CHARGER

Filed March 21, 1938 2 Sheets-Sheet 1

Fig. 1.



Witness:
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Fig. 3.

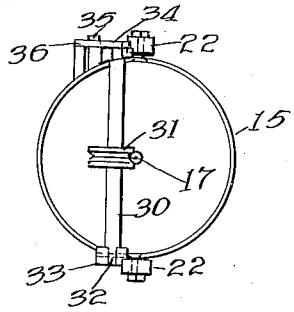


Fig. 4.

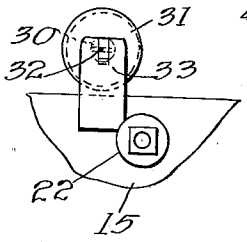


Fig. 5.

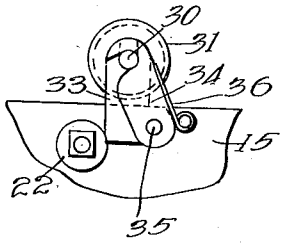


Fig. 2.

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Patented June 4, 1940 2,203,307

UNITED STATES PATENT OFFICE

2,203,307

FURNACE CHARGER

John N. Richardson, Chicago, Ill.

Application March 21, 1938, Serial No. 197,087

13 Claims. (Cl. 214—18)

This invention relates in general to a furnace charger of the vertical bucket type having a bottom discharging cone by which the bucket is supported and is more particularly described with a traveling hoist and also with a supporting track type of installation.

An important object of the invention is in the provision of improved means for moving a furnace charging bucket from a position at the side of a furnace to a discharging position within the walls of the furnace.

A still further object of the invention is in the provision of an improved simple transfer means for automatically moving a charging bucket from a position at one side of a furnace laterally into and within the furnace by the raising and lowering movement of the bucket.

A still further object of the invention is in the provision of a swinging type of carrier for engaging a furnace charging bucket and moving it laterally in accordance with the raising and lowering movement of the bucket in contact with said means whereby it is swung into and out of discharging position within a furnace.

A still further object of the invention is in the provision of a counter-weighted swinging structure normally positioned at the outside of a furnace and in the path of a bucket raised and lowered for charging the furnace and actuated by the raising and lowering movement in engagement with the pivoted swinging structure and operated by the raising and lowering movement to discharge the contents of the bucket within a furnace automatically.

A still further object of the invention is in the provision of improved means for maintaining the charging bucket in upright position although attached to an outwardly inclined supporting cable and swung inwardly within a furnace in discharging position.

Other and further objects of the invention will appear hereinafter, the accompanying drawings illustrating two preferred types of the invention in which

Fig. 1 is a side view partly in section illustrating the invention as applied to a furnace with an overhead horizontal carrier;

Fig. 2 is a view partly in section illustrating the invention as applied to a furnace and having a supporting track for guiding the raising and lowering path of the bucket;

Fig. 3 is a top view of the charging bucket showing the pivotal mounting of the cable guide;

Fig. 4 is a view showing the pivotal end of the cable guide; and

Fig. 5 is a view of the detachable hook at the other end of the cable guide.

In charging a vertical furnace from the bottom of a cone supported vertical bucket either through the side of the furnace or at the top thereof, it frequently is necessary to move the bucket from a charging position upwardly and over a space which is encumbered by various obstructions which make it impossible to use a track. In such a case a vertical beam 10 is mounted at the side of a furnace 11 above the top, or a lateral fill opening 12 therein so that the beam does not obstruct or extend within the walls of the furnace. A loading pit 13 is provided in the ground or floor 14 below the beam 10 and at any distance from the furnace so that a considerable space may intervene between the pit and the furnace.

A charging bucket 15 having a supporting cone base 16 is carried by means of a cable 17 wound upon a drum 18 of a wheeled carrier 19 by a motor 20. The carrier is moved along the beam 10 upon wheels 21 and suitable controls, preferably electrical, not shown, are provided for operating the motor or motors to raise and lower the bucket and to move it along the beam at the same time so that the bucket may be raised directly from the loading pit 13 upon the indicated line *a* or it may be raised or lowered and moved laterally, substantially in the path *b* from one position to the other.

At opposite sides of the upper edge of the bucket are outward projections 22 each adapted to engage in a hook 23 at the upper end of an arm 24 of a lever mounted upon a transverse pivot 25 supported by a bracket 26 and the lower end of each lever having an enlarged or counter-weighted portion 27 limited in its movement by a stop 28 carried by the bracket, the two opposite levers being connected by a cross-piece 29 so that they will move in unison.

Also extending across the top of the bucket 15 is a cable guide comprising a shaft 30 mounted at its ends at the sides of the bucket and having a central sheave 31 adapted to engage the cable 17 when the bucket is swung inwardly within the furnace. In the charging position this cable guide is in the way so the shaft 30 is pivoted upon a hinge 32 at one end and rests in a forked socket 33 at the other end where it is retained in position by a latch 34 mounted upon a pivot 35 and held yieldingly in place by a spring 36. To move the cable guide the hook 34 is disengaged and the shaft 30 is swung upwardly about its pivot or hinge 32 at the other end.

At the upper edge of the furnace opening 12 is an idler sheave 40 adapted to engage the bucket supporting cable 17 in its limiting position and to form a guide about which the cable is deflected when the bucket is swung inwardly to discharging position. At the lower side of the opening is a fixed projection or stop 41 for engaging both of the pivoting arms 24 when they are swung inwardly, thereby limiting the inward movement of the arms and also limiting the movement of the bucket shell, but not the bottom thereof.

In operating the structure shown in Fig. 1 the bucket is raised from the charging position until the side projections 22 of the bucket engage the hooks 23 of the swinging structure whereupon the lowering movement of the bucket then automatically swings the bucket laterally with the arms through the furnace opening, or over the top of a furnace within the wall thereof and into a charging position with the arms 24 resting upon the fixed stops 41. In this position the cable 17 is deflected by the fixed sheave 40 at the upper side of the charging opening and by the guide sheave 31 mounted on the bucket itself. Further lowering movement of the cable causes the bottom 16 to be dropped vertically with respect to the bottom of the bucket, thereby allowing the contents of the bucket to be discharged within the furnace 11.

When the contents of the bucket is discharged the action is reversed, the first raising movement closing the bottom against the the lower edge of the bucket, then raising the bucket in connection with the swinging structure which moves the bucket outwardly until the counter-weighted portions of the swinging structure are engaged by their stop 26 which holds the arms 24 in upright position ready for the next engagement, the bucket being moved outwardly and then downwardly to loading position.

In the structure shown by Fig. 2, a similar action and operation is provided except that an inclined supporting track 42 is provided upon which the wheeled bucket hoisting carrier 19 is shown as raised and lowered by a cable 45 attached thereto, passing around sheave 44 at the upper end of the track and extending to a separate motor operated drum 46. When the bucket is moved into the hooks 23, the lowering movement swings the bucket inwardly on the arms 24 and the discharging and returning movement is the same as previously set forth.

In both of these forms the movement and operation of charging and returning the bucket is extremely simple, it is entirely automatic, and once arranged and set for any installation, no further attention need be paid thereto. Usually the controls for the motor or hoisting mechanism are simply in the form of switches which are opened or closed as desired.

With this construction no complicated carrier supporting track or counter-weighting mechanism is necessary. The movable swinging means consists simply of a pair of counter-weighted arms which automatically move to a fixed receiving position outside of the furnace, or they are moved there by the return of the bucket, and when the bucket is raised to the proper position it engages in the arms so that by a continued lowering movement the bucket is first swung into or over the top of the furnace in a discharging location with respect to the walls thereof, and the continued movement of the lowering means moves the bottom downwardly to discharging position. Thus a great amount of operating structure and mechanism is avoided and the installation is simple, reliable, inexpensive, and may be easily applied in a variety of ways.

I claim:

1. A furnace charger comprising an upright furnace with a lateral charging opening, a charging bucket, means for raising and lowering the bucket, and means comprising arms pivoted at the side of the furnace having portions to engage the bucket and swing it uprightly into and out of the said opening by the lowering and raising movement of the bucket.

2. The combination with a furnace charged from the top thereof, of a charging bucket with a bottom discharge, means located entirely at one side of the furnace for raising and lowering the bucket, and means separate from the raising and lowering means comprising pivoted arms normally located entirely at one side of the furnace with end portions engaged by the bucket in its movement to swing it laterally in upright charging position inside of the furnace.

3. In a charger for an upright furnace, a bucket with a discharge bottom, means for raising and lowering the bucket, means comprising arms pivotally mounted at the side of the furnace with extremities for engaging and swinging the bucket laterally in upright position within and at the top of the furnace to discharge therein from the bottom of the bucket.

4. In a furnace charger, a bucket with a discharge bottom by which it is supported in upright position, means for raising and lowering the bucket, movable means comprising pivoted arms normally located outside of the wall of a furnace and end hooks on the arms in the path of the bucket to engage and move it inwardly of the wall of a furnace for discharging from the bottom of the bucket.

5. In a furnace charger, a bucket with a discharge bottom by which it is supported, means for raising and lowering the bucket by means of the bottom, movable means comprising arms pivoted at the outside of a furnace having end portions engaged by a bucket in raising it and movable to swing the bucket within a furnace when the bucket is then lowered, a stop for engaging said movable means and arresting the movement of the bucket, and the bottom being lowered for discharging by the continued lowering movement of said first means.

6. In a furnace charger, a bucket having a movable discharge bottom by which it is supported, a raising and lowering cable attached to the bottom and extending through the bucket for suspending it, means comprising pivoted arms with end hooks for engaging the bucket at the side of a furnace and swinging it within the furnace, and a guide for the cable at the top of the bucket to keep it centered when the outer portion is inclined.

7. In a furnace charger, a bucket having a movable discharge bottom by which it is supported, a raising and lowering cable attached to the bottom and extending through the bucket for suspending it, means comprising pivoted members having end hooks for engaging the bucket at the side of a furnace and swinging it within the furnace, raising and lowering means for the cable, a sheave above said engaging and swinging means to deflect the cable when the bucket is swung, and a guide at the top of the bucket to deflect and guide the cable keeping the bucket in upright position and the bottom centered therein.

8. In a furnace charger, a bottom charging bucket and a central cable for suspending it, means for raising and lowering the bucket, an arm pivoted at the side of a furnace having means at the free end to engage the bucket and swing it inwardly of the furnace in upright position when the bucket is lowered after such engagement.

9. In a furnace charger, a bottom charging bucket and a central cable for suspending it, means for raising and lowering the bucket, a pair of pivoted arms having hooks at their free ends positioned outside a furnace for engaging a bucket at opposite sides and swinging the bucket laterally into a furnace when the bucket is then lowered in such engagement.

10. In a furnace charger, a bottom charging bucket and a central cable for suspending it, means for raising and lowering the bucket, a pair of counter-weighted levers pivoted at the side of a furnace with means at free ends to engage a bucket and swing it laterally into and out of discharging position within the furnace, the counterweight returning and holding the levers in position to engage the bucket.

11. In a furnace charger, a bottom charging bucket and cable means attached to the bottom for suspending it, means for raising and lowering the bucket, a pair of connected levers pivoted intermediate their ends at the outer side of a furnace to be charged and having a counterweight at one end for returning and holding the levers in position to engage the bucket and having hooked extremities at the other ends to engage the opposite sides of the bucket, the arms and bucket swinging laterally and bodily together into the side of a furnace when the bucket is lowered after engagement with the hooks of the arms, a stop to limit the movement of the arms and the bucket within a furnace, and the bottom being lowered for discharging by the continued operation of said lowering means.

12. A structure in accordance with claim 11 in which the raising and lowering means includes an inclined guide track extending from the loading position and the bucket has projections at opposite sides to engage the bucket in the hooked extremities of the arms for swinging movement therewith.

13. In a furnace charger, a bucket having side projections at the top and a movable discharge bottom with a centrally attached suspension cable extending through the top of the bucket, means for raising and lowering the bucket from loading to discharging position, a pivoted structure at the side of a furnace having means at the free end to engage the side projections and support a bucket therein as the bucket is swung inwardly and lowered by said raising and lowering means after such engagement, stops to limit the movement of the said structure in both directions, and means for deflecting the cable in the discharging position comprising a fixed pulley sheave above the pivoted structure and a cable guide attached to the top of the bucket, including a shaft and a sheave for centering the cable at the top of the bucket, the said guide being movable to an unobstructing location when the bucket is in loading position.

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