Dec. 7, 1926. 1,609,919

C. E. UNDERWOOD

APPARATUS FOR CHARGING COKE OVENS

Filed August 19, 1920 3 Sheets-Sheet 1

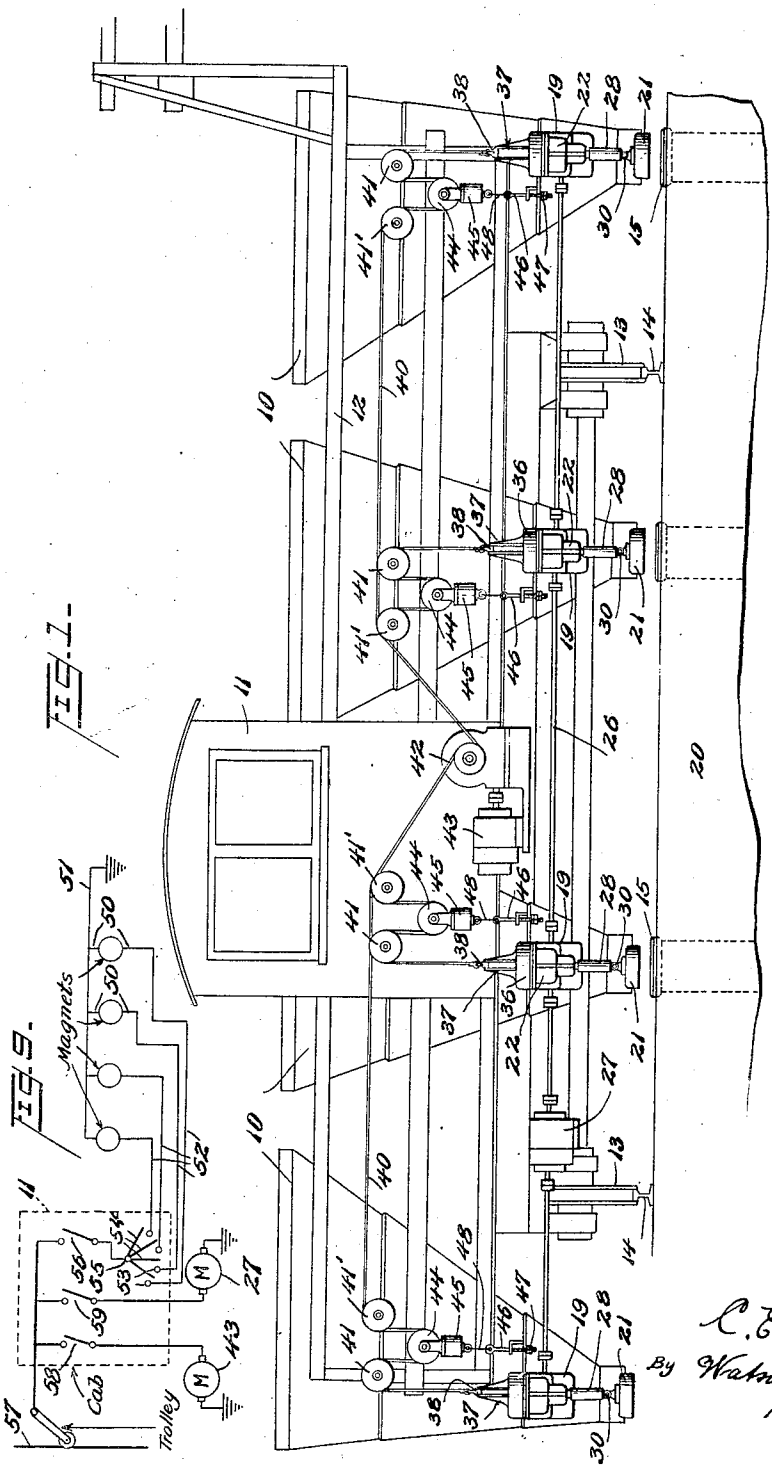
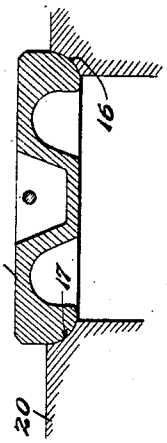


FIG. 1.

FIG. 2.



Inventor
C. E. Underwood,
By Watson, Cole, Grosvenor & Grindle,
Attys

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C. E. UNDERWOOD

APPARATUS FOR CHARGING COKE OVENS

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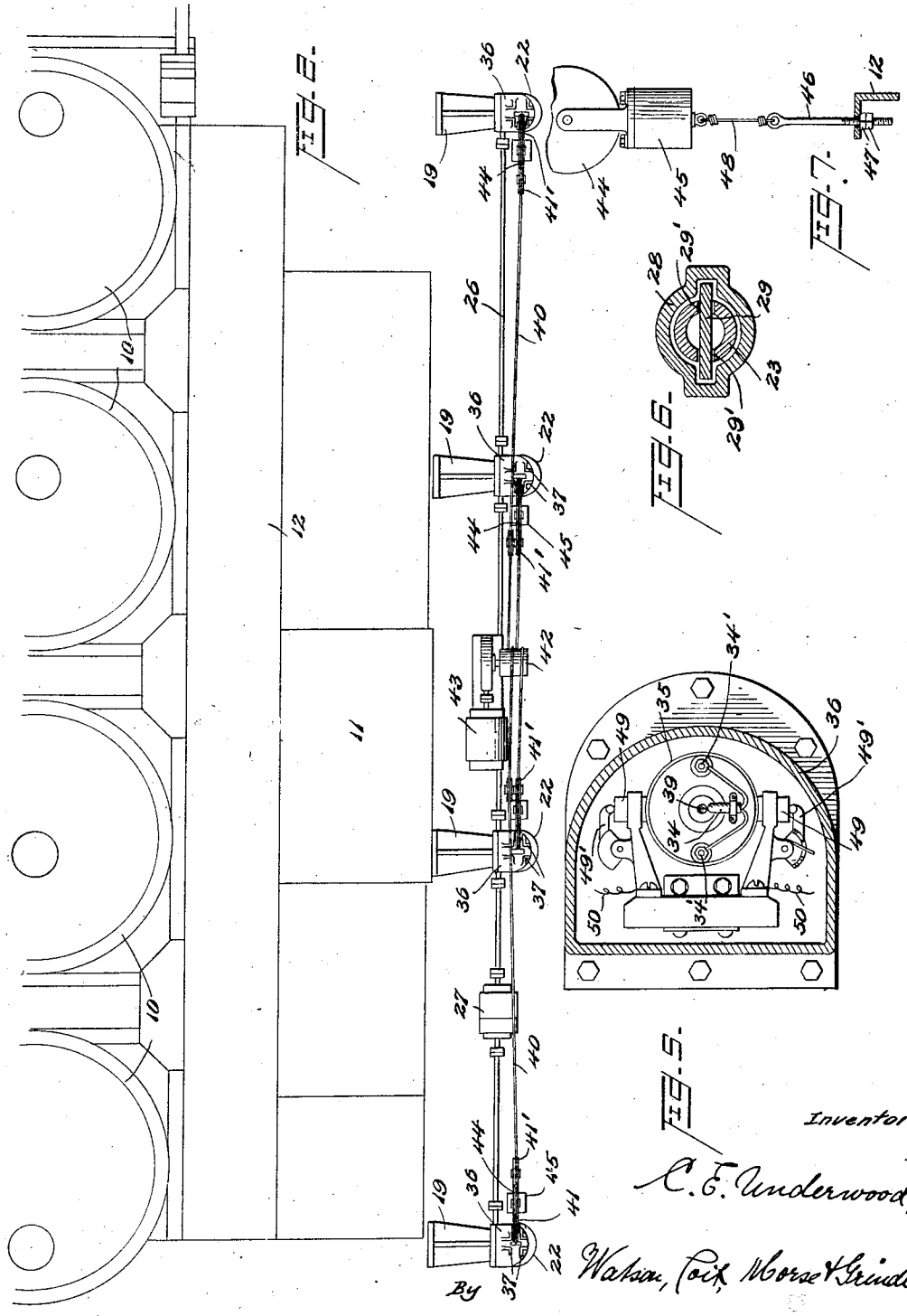

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C. E. UNDERWOOD

APPARATUS FOR CHARGING COKE OVENS

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FIG. 3.

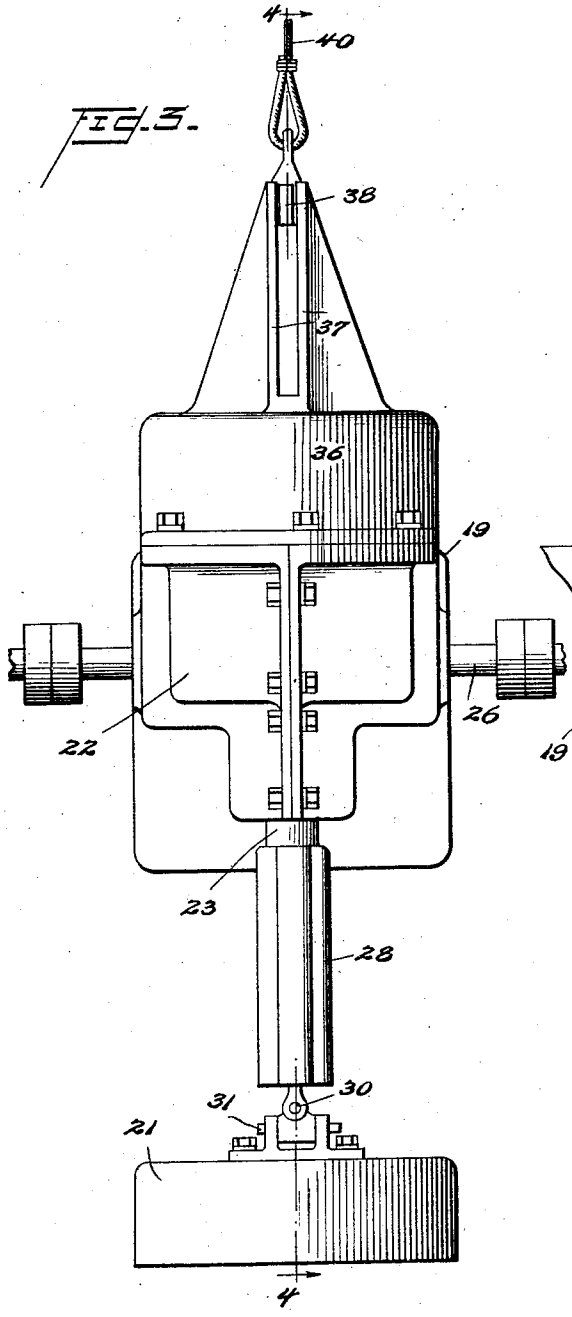
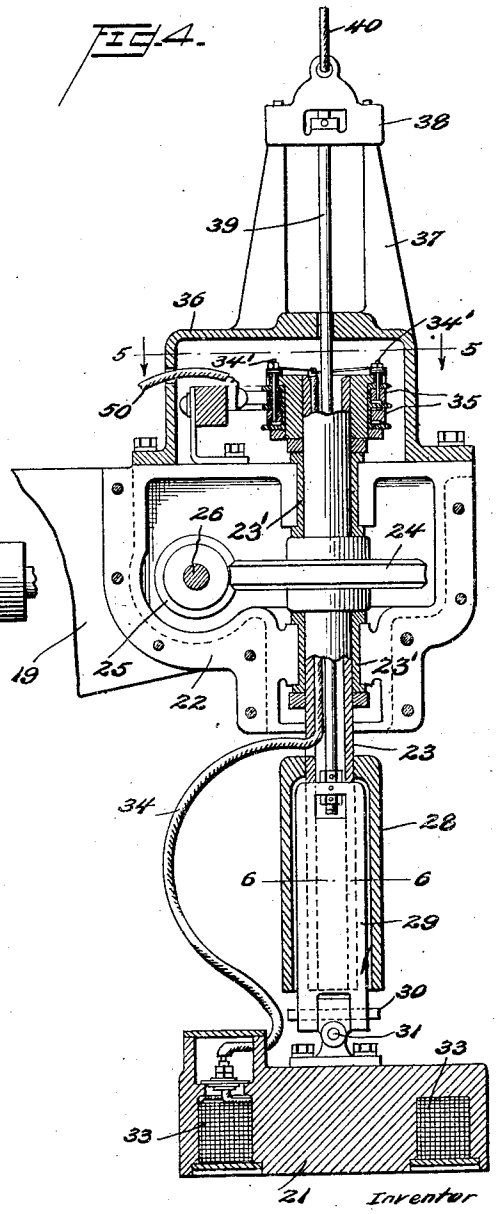


FIG. 4.



Inventor

C. E. Underwood,

By Watson, Cole, Morse & Grindle,

Att'ys

Patented Dec. 7, 1926.

1,609,919

UNITED STATES PATENT OFFICE.

CHARLES E. UNDERWOOD, OF BETHLEHEM, PENNSYLVANIA, ASSIGNOR TO BETHLEHEM STEEL COMPANY, OF BETHLEHEM, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

APPARATUS FOR CHARGING COKE OVENS.

Application filed August 19, 1920. Serial No. 404,578.

The present invention relates to apparatus for removing and replacing the cover of an opening through which material is to be supplied. More specifically the invention relates to an apparatus for charging ovens or furnaces and consists in the provision of means for removing the covers of the charging openings of the ovens and for replacing the same after the charges have been introduced into the ovens. In the form of the invention illustrated a charging car or larry provided with charging hoppers is equipped with the automatic cover lifting and replacing means. In the embodiment shown this means includes electro-magnets, one for each hopper of the charging car. These magnets are suspended on the larry and under control of the operator. The invention further comprehends the provision of means for raising and lowering the magnets and also rotating the same so that the cover is seated with a spinning motion. Heretofore, the covers have been removed and reseated by hand, a workman being stationed on the top of the battery ovens for this purpose. Obviously, considerable time was consumed in removing and replacing the covers and furthermore the task was a difficult and onerous one on account of the heat and escaping fumes. As far as known, it has not heretofore been proposed to do this work by power operated means. Hence, although the electro-magnets constitute the best and most convenient means as yet devised for the purpose, the invention is not limited to this particular construction but includes others for accomplishing the same result.

The objects and features of novelty of the invention will be apparent from the description taken in connection with the drawings in which:

Figure 1 is a front elevation of an oven charging car or larry equipped with the present invention:

Figure 2 is a plan view of part of the larry and the apparatus of the present invention;

Figure 3 is a front elevation of one of the magnets and associated parts;

Figure 4 is a vertical sectional view of the same taken substantially on the line 4—4 of Figure 3;

Figure 5 is a horizontal sectional view of the same taken substantially on the line 5—5 of Figure 4;

Figure 6 is a sectional view taken substantially on the line 6—6 of Figure 4;

Figure 7 is an enlarged view of a detail of the hoisting mechanism;

Figure 8 is a sectional view through one of the charging hole covers; and

Figure 9 is a diagrammatic view of one scheme of wiring for controlling the magnets and the motor.

Referring to the drawings, the hopper car or charging larry with which the present invention is shown, comprises a framework 12, four charging hoppers 10, the operator's cab 11 and wheels 13 by which it runs on the track 14, laid above the battery of ovens indicated at 20. These ovens have charging openings closed by the covers 15, as shown in Figure 1 and on a larger scale in Figure 8. From this latter view it will be seen that the openings have concave seats 16 for the covers, and that the latter are convexly curved as at 17 to fit the seats, the object of this construction being to enable the covers to come to a gas tight fit on their seats when dropped thereon, as will be described hereinafter.

As previously stated, one of the principal objects is to provide means for removing and replacing the covers of charging openings. To this end the larry is equipped with apparatus for raising the covers and thereafter replacing the same. As shown, electro-magnets are employed for this purpose, there being one for each hopper of the larry. Preferably, the magnets 21 are carried by brackets 19 on the car or larry, there being a magnet for each hopper disposed so as to come directly over the cover of the charging opening. The magnets and means

for supporting the same are identical and hence it will be necessary to describe only one.

In the form of the invention illustrated, the cover raising device is carried by a bracket 19 including a body portion 22. A vertical sleeve 23 extends through this bracket, being journaled in the spaced bearings 23'. Between these bearings the sleeve carries a worm wheel 24. As will appear hereinafter the sleeve 23 is rotated in order to spin the covers of the openings and the mechanism for accomplishing this result includes the worm wheel 24 driven by a worm 25 secured on a shaft 26, which extends throughout the length of the larry and through each of the brackets 19. This shaft 26 is preferably driven by an electric motor such as illustrated at 27. At its lower end the sleeve 23 is surrounded by a casing 28 and is provided with oppositely disposed slots 29'. A plate 29 is arranged within the casing 28 and disposed in the slots 29' of the sleeve so that the plate is carried for rotation with the sleeve but may telescope relative thereto. The plate 29 carries the electro-magnet 21 at its lower end. Preferably, the connection between these parts includes pivots 30 and 31 disposed at right angles to each other so that the magnet is swivelled to the plate and may adjust itself to the cover 15, whether the latter is truly horizontal or not. As the magnets are mounted for rotation it is necessary to provide suitable conductors for energizing the same that will permit rotation of the magnets. As shown, suitable conductors extend from the magnets being formed into the cable 34. This cable is led through an aperture in the wall of the sleeve 23 just above the casing 28 and then upwardly to the top of the sleeve where the conductors are fastened to binding posts 34' (see Figure 5). Each of these binding posts is in electrical contact with one of the collector rings 35 (see Figure 4), these rings being carried by the sleeve 23 and disposed within a housing 36 carried on the top of the body portion 22 of the bracket 19. Current is supplied to the collector rings 35 through the leads 50 which in turn are in electrical communication with brushes 49, these brushes being held in contact with the rings 35 by spring actuated arms 49'. The top of the housing 36 carries the guides 37 forming a guideway for the crosshead 38. This crosshead rotatively carries the rod 39 which depends from the same through the sleeve 23 and at its lower end is secured to the plate 29, as clearly shown in Figure 4. The crosshead 38 together with the magnet is raised and lowered through a cable 40. Referring to Figure 1 it will be seen that the cable 40 passes from each crosshead 38 upward to a sheave 41, thence downward around the counterweight sheave 44, thence upward around a sheave 41' located at the same elevation as the sheave 41. From the sheave 41' the cable in each case is guided to a hoisting drum 42. When this drum is rotated in the proper direction the cables will be wound up thereby elevating the magnets. The drum 42 may be rotated by a reversible motor 43.

The counterweight for each of the magnets is suspended from the sheave 44 being illustrated to a larger scale in Figure 7. This device constitutes a yieldable element in the hoisting connection for the magnets, the upward movement of which is limited by a stop rod 46 carrying nuts 47 passing through a hole in one of the frame members 12. The nuts 47 thus act as a stop to limit the upward movement of the counterweight sheave 44. The rod 46 is connected to the counterweight by a wire 48 of such size that it will break under excessive strain, thus constituting a safety device for the machinery in case of overhoisting.

Figure 9 illustrates one scheme of wiring for controlling the magnets and the motors from the cab 11 of the larry. As shown one of the leads 50 of each of the magnets is connected to a ground wire 51. Each of the other leads 50 is connected by a wire 52 to a terminal 53 of a switch 54 there being one of these switches for each of the terminals 53. Each of the switches 54 is connected with a common terminal 55 which through a switch 56 is in communication with one conductor 57 of the supply mains. The other electrical main may be the track on which the larry runs and in the diagram is indicated as a ground. The motor 43 is supplied from the main 57 through a controller 58 located in the cab and the motor 27 is likewise supplied from the main 57, a controller 59 in the cab being provided to control its operation. With the arrangement shown for the magnets it will be seen that as many of the magnets will be actuated as there are switches 54 thrown in, when the switch 56 is closed. In this manner it is possible to control the number of magnets operated and of course through the switch 56 the time of the energization of the magnets is under the immediate control of the operator in the cab. Furthermore, the periods of energizing the magnets may be selectively controlled by the switches 54, so that one or more of the magnets may be energized for a longer or shorter period than the others. In this manner the times of spinning the covers may be selectively controlled. Thus if one or more of the magnets are de-energized before the others, the times of spinning of the covers carried by these magnets will be less.

In the operation of the apparatus described, it will be understood that the hoppers on the larry are charged. The larry

is then run towards the ovens until the magnets are directly over the covers 15. The hoisting motor 43 is then operated to lower the magnets into contact with the covers approximately at which time the magnets may be energized by closing the switch 56 and then the hoisting motor again operated but in the reverse direction, to lift the magnets together with the covers. The larry is now moved forward to bring the hopper outlets in line with the charging openings, whereupon the hopper bottoms are opened in the usual way and the ovens charged through their openings. Thereafter the larry is run back to bring the suspended magnets and covers over the openings again. Then the winding drum is operated in the direction to lower the magnets and at the same time the motor 27 is operated to rotate the magnets and covers. This rotation of the magnets as the covers are lowered onto the openings, acts to effectively cause the covers to spin or grind themselves on their seats thereby obtaining a tight fit. If preferred the magnets may be deenergized before the covers have been lowered into actual contact with their seats so that the covers will fall to their seats while rotating or spinning.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent is:—

1. In apparatus for opening and closing a door, the combination of a member adapted to be coupled and uncoupled with respect to a door, means for moving the member to remove or to seat the door, and means to rotate the member to impart spinning motion to the door while the latter is being seated.

2. In a larry for charging coke ovens and the like, the combination with a hopper, of power-operated mechanism for engaging and lifting the cover of the charging opening, and means to rotate said cover as it is returned to its seat.

3. In a larry for charging coke ovens and the like, the combination with a hopper, of lifting means in front of said hopper, means carried by the lifting means for engaging a charging-opening cover in any angular position, and means to rotate the lifting means.

4. In a larry for charging coke ovens and the like, the combination with a charging hopper thereon, of means supported for vertical movement in front of said hopper and adapted to engage the cover of the charging opening, power mechanism to raise and lower said means, and mechanism to rotate the same as it is being lowered.

5. In a larry for charging coke ovens and the like, the combination with a charging hopper thereof, of vertically slidable means in front of said hopper and adapted to engage the cover of the charging opening, hoisting mechanism on the larry to raise and lower said means, and mechanism to rotate said means.

6. In a larry for charging coke ovens and the like, the combination with a charging hopper thereof, of means supported and guided for vertical movement in front of said hopper, a device carried by said means to engage the cover of the charging opening of the oven, power mechanism on the larry to raise and lower said means, and other power mechanism to rotate said means as it is being lowered.

7. In a larry for charging coke ovens and the like, the combination with a charging hopper, of a bracket secured to the larry in front of said hopper, a vertical sleeve rotatably journaled in said bracket, a member slidable but not rotatable in said sleeve, a device adapted to engage the cover of the charging opening and pivoted to the lower end of said member, means to raise and lower said member, and means to rotate said sleeve.

8. In a larry for charging coke ovens and the like, the combination with a charging hopper, of a vertical sleeve journaled in front of said hopper, means to rotate said sleeve, a member slidable but not rotatable in said sleeve, cover-engaging means universally connected to the lower end of said member, a hoisting mechanism connected to said member, and a power shaft geared to said sleeve to rotate the same.

9. In a larry for charging coke ovens and the like, the combination with a charging hopper thereof, of a bracket secured to the larry in advance of the hopper, a member vertically slidable and rotatable in said bracket, a device carried by said member to engage the cover of the charging opening, power connections to raise and lower said member, and other power connections to rotate the same.

10. Apparatus of the character described, including in combination, a support, means carried by said support to remove the cover of an opening, and means to spin said cover as it returns to its seat.

11. In a larry for charging coke ovens and the like, in combination, means to raise and lower a plurality of covers for the charging openings of the ovens, means to spin said covers as they are being lowered to their seats, and means to selectively control the time of spinning said covers whereby one or more may be spun for a longer period than the others.

12. In a larry for charging coke ovens and the like, in combination, means to remove and replace a plurality of the covers for the charging openings, means to spin said covers as they are being replaced, and

means to selectively control the period of the spinning action whereby one or more covers may be spun for a longer or shorter interval than the others.

13. In a larry for charging coke ovens and the like, in combination, means to raise a plurality of the covers of the charging openings and thereafter drop them on their seats, means to spin said covers before they are dropped, and means to selectively control the times of the dropping of said covers.

In testimony whereof I affix my signature.

CHAS. E. UNDERWOOD.