Jan. 3, 1939. R. F. KRALL 2,142,447

COKE-OVEN DOOR-OPERATING MACHINE

Filed Nov. 26, 1937 2 Sheets-Sheet 1

Fig. 1.

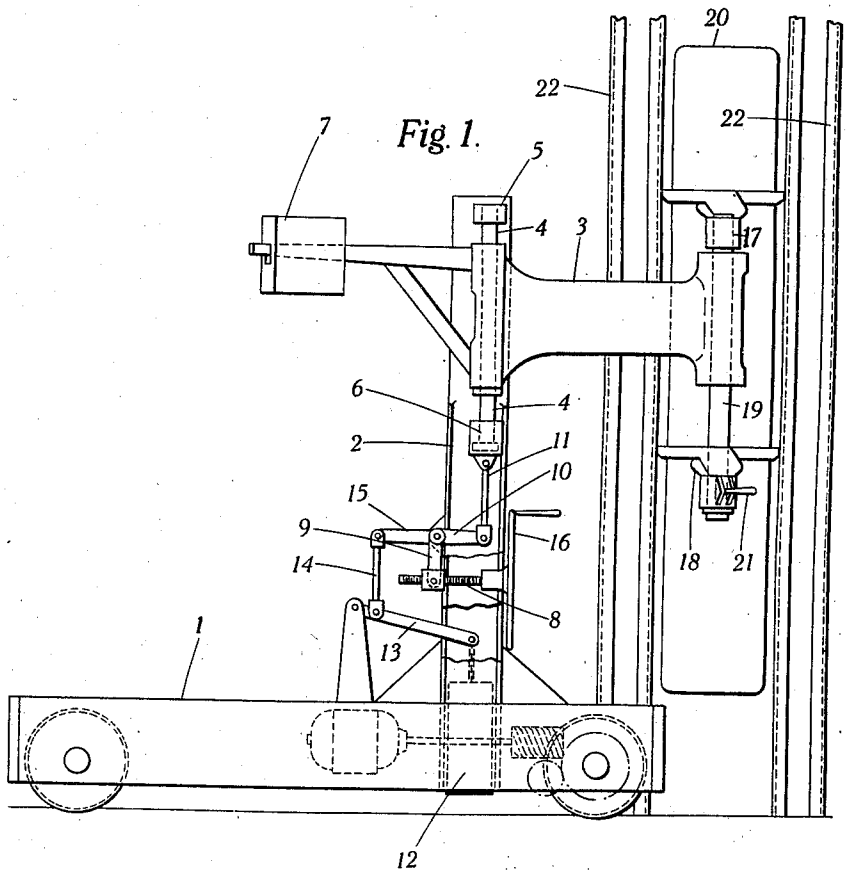
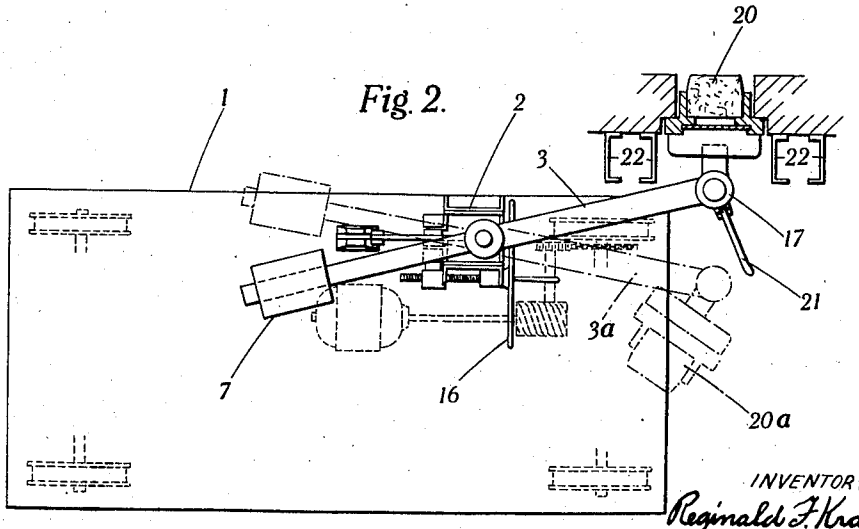


Fig. 2.



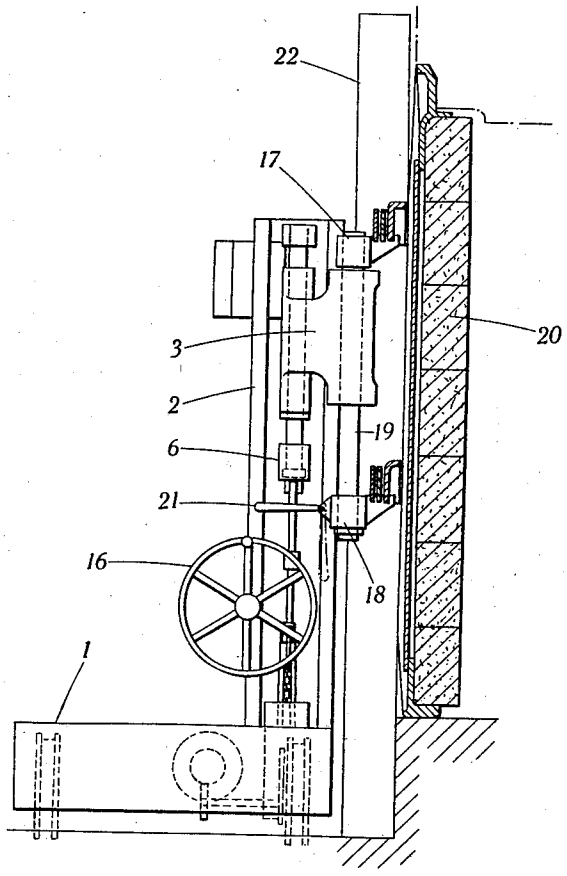
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Fig. 3.



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COKE-OVEN DOOR-OPERATING MACHINE

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Application November 26, 1937, Serial No. 176,733
In Great Britain December 8, 1936

4 Claims. (Cl. 212—4)

This invention relates to improvements in coke-oven door-operating machines, which machines are employed for removing and replacing the heavy doors closing the ends of horizontal coke-ovens.

Before discharging a coke-oven, the doors at each end of the oven are removed, and a ram operated by the pusher machine on the pusher side of the oven battery then enters the oven to force out the coke into the coke car on the coke side of the battery. Door-removing and replacing mechanism is usually arranged on the pusher machine for removing the doors on this side of the battery, whilst the door-operating machine on the coke side of the battery usually carries a coke guide through which the coke is carried over the track of the door machine, into the coke car.

The principal object of the present invention is to provide a door-operating machine which includes in itself simple and efficient means for withdrawing and replacing a coke-oven door, for supporting the door while removed from the oven, and for raising the door off its seating in the oven prior to removal and lowering the door on to its seating after its return to the oven.

A further object of the present invention is to provide a door-operating machine in which the door whilst removed from the oven and supported on the machine, can be positioned so that it is easily accessible for cleaning or adjustment.

According to the present invention, a coke-oven door-operating machine includes a jib-member mounted for rotation about a vertical axis, which axis when the machine is in the operative position is situated to one side of the oven door which is being removed, a hook or hooks at the end of the jib-member for engaging the oven door, and means for raising and lowering the jib-member vertically on its axis of rotation.

According to a further important feature of the invention, the hook or hooks provided at the end of the jib-member for engaging the door are also rotatable about a vertical axis at the end of the jib-member.

In the door machine of the present invention the axis of rotation of the jib-member is situated to one side of the door which is being removed, and moreover, the machine is so arranged that the axis of rotation of the jib-member is relatively near to the face of the oven battery. In consequence, when the jib-member is rotated on its pivot, the direction of movement of the end of the jib, over that part of its path which is adjacent to the mouth of the oven, is approximately perpendicular to the face of the oven battery, so that the door is withdrawn in the proper direction. It will be noted that, in the present invention, it is solely the arcuate motion of the end of the jib which effects the withdrawal of the door from and its replacement in the oven.

Prior to the removal of the door, the door must be raised slightly off its seating in the oven, and by means of the present invention the necessity of having separate mechanism for this purpose on the door machine is obviated by the use of a vertically-movable jib-member, and the raising and lowering of the door is effected by vertical movement of the jib-member as a whole on its mounting.

Door-operating machines according to the present invention are mainly intended for use on the coke side of the battery, and the invention will therefore be described with reference to a door machine for the coke side. It will, however, be apparent to those skilled in the art that the arrangement hereinafter described can easily be adapted for use on the pusher side of the battery, if desired, and the application of the door machine to this purpose is within the scope of the present invention.

The accompanying diagrammatic drawings show the principal constructional features of a coke-oven door-operating machine according to the present invention. In the drawings, Figure 1 is a side elevation of the machine, Figure 2 is a plan of the machine and Figure 3 is an end elevation of the machine looking towards the left along the oven battery.

Referring to the figures, the machine is mounted on a car 1 running on rails along the coke side of a battery of ovens in the usual manner.

A strong vertical post 2, suitably stayed, is mounted on the car 1. The jib-member 3 carries a pivot 4 turning in a top bearing 5 and a bottom footstep bearing 6, which bearings are designed to support the weight and thrust imposed when a heavy coke-oven door is carried on the outer end of the jib-member 3.

The bearings 5 and 6 slide in suitable guides on the post 2, and are attached to the pivot 4 in such a manner that, as the pivot 4 moves vertically, the bearings 5 and 6 move with it in their guides. A counterweight 7 is arranged as shown on the side of the pivot 4 opposite to the jib-member 3.

The jib-member 3 is raised and lowered on its axis of rotation by a screw 8. The screw 8 works in a screwed block at one end of the arm 9 of a rigid bell-crank lever, the arm 10 of the bell-

crank being connected by the link 11 to the footstep bearing 6 for the pivot 4. The jib-member is counterweighted for its vertical motion by the counter-weight 12 acting through the linkage 13, 14 and 15, the arm 15 forming a continuation of the bell-crank lever 10. The screw 8 may be turned by a hand wheel 16, or by a geared-down electric motor.

At the outer end of the jib-member 3 are hooks 17 and 18 for engaging the oven door 20. In the preferred arrangement shown, the hooks 17 and 18 are mounted on a vertical shaft 19 rotatable in bearings at the end of the jib-member 3, whereby the door, after removal from the oven, may be turned aside for cleaning or adjustment. A pivoted lever 21 on the lower hook 18 enables the hook arrangement to be turned easily.

Alternatively, for use with certain known types of coke-oven doors, the lower hook 18 may be replaced by a buffer arrangement of known type for steadying the lower part of the door.

When a door is to be removed from an oven, the machine is positioned so that the hooks 17 and 18 are in front of the door to be removed, the jib-member being in its lowest position. The jib-member is then raised vertically, the first part of the movement bringing the hooks 17 and 18 into engagement with the co-operating elements on the oven door whereby the door latches are released, and the further vertical movement of the jib-member then raises the door off its seating in the oven. The jib-member is then rotated about its vertical axis to the position 3a shown in dotted lines on Figure 2, whereby the door is withdrawn from the mouth of the oven between the buckstays 22, after which the door can be turned to approximately the position 20a shown in Figure 2, where it is conveniently accessible for cleaning or adjustment. The car 1 is then moved along the battery to bring the coke guide or other ancillary apparatus into position before the mouth of the oven. When the door is to be replaced in the oven, the sequence of operations indicated above is reversed, the action of lowering the jib-member 3 first reseating the door in the oven, and then withdrawing the hooks 17 and 18 out of engagement with the door.

What I claim is:—

1. Coke-oven door-operating machine comprising in combination a jib-member mounted for rotation about a single vertical axis, which axis when the machine is in the operative position being situated to one side of the door which is being removed, a hook-member rotatable about a vertical axis at the end of said jib-member for engaging the door, and means for raising and lowering the jib-member vertically on its axis of rotation.

2. Coke-oven door-operating machine, comprising in combination a carriage movable along the coke-oven battery, a framework on said carriage, a jib-member, bearings supporting said jib-member and permitting rotation of the same about a vertical axis, guides on said framework in which said bearings are vertically movable, means to raise and lower said jib-member and said bearings in said guides, the axis of rotation of said jib-member in the operative position being situated to one side of the door to be engaged and a hook-member rotatable about a vertical axis at the end of said jib-member.

3. Coke-oven door-operating machine, comprising in combination a jib-member mounted for rotation about a vertical axis, which axis when the machine is in the operative position is situated to one side of the door to be engaged, a hook-member rotatable about a vertical axis at the end of said jib-member for engaging the door, means for raising and lowering said jib-member vertically on its axis of rotation, and means for counterbalancing the weight of said jib-member.

4. Coke-oven door-operating machine, comprising in combination a jib-member mounted for rotation about a vertical axis, which axis when the machine is in the operative position is situated to one side of the door to be engaged, a hook-member at the end of said jib-member for engaging the door, means for raising and lowering said jib-member vertically on its axis of rotation, a counterbalancing weight for the weight of said jib-member, and a linkage interposed between said counterbalancing weight and said jib-member.

REGINALD FRANK KRALL.