Dec. 18, 1945. L. WILPUTTE 2,391,214

COMBINATION COKE OVEN DOOR-HANDLING, PUSHING AND LEVELING MACHINE

Filed May 6, 1944 4 Sheets-Sheet 1

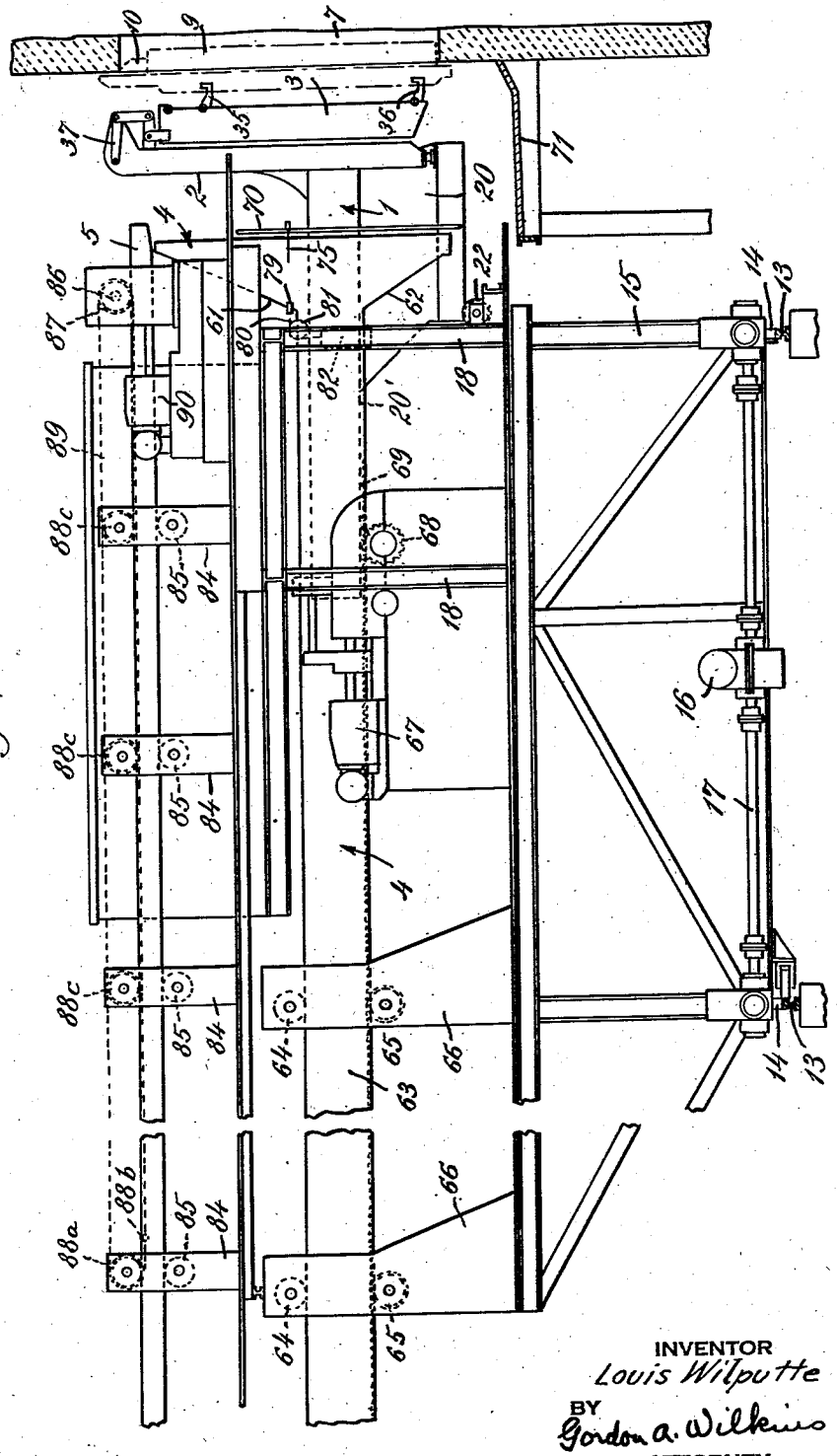


Fig. 1.

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Fig. 2.

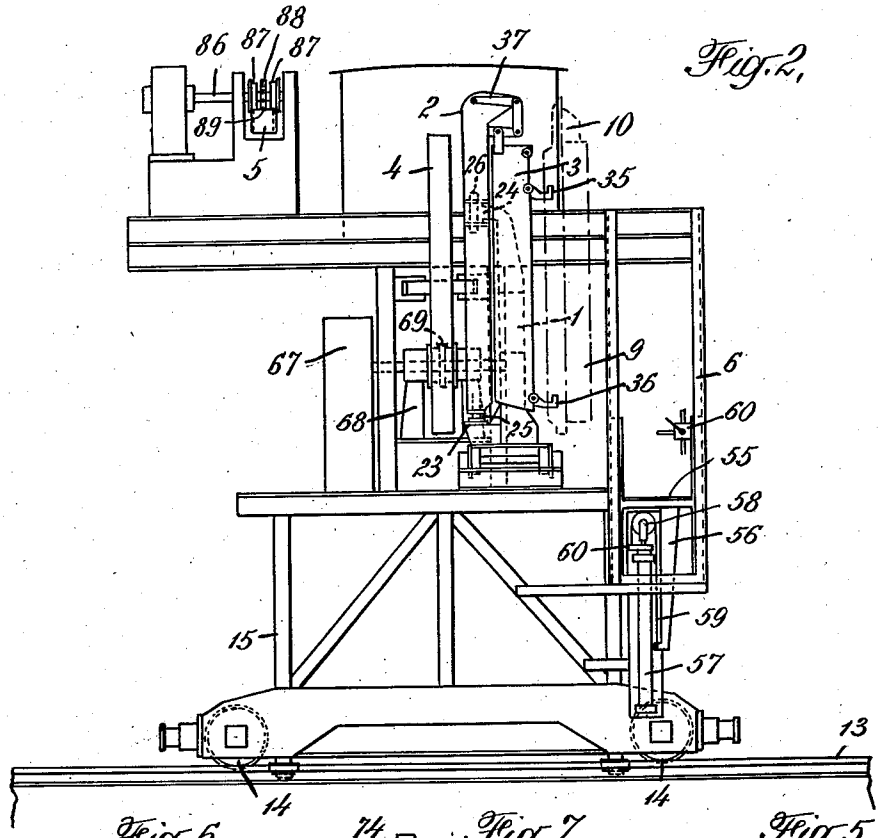


Fig. 6

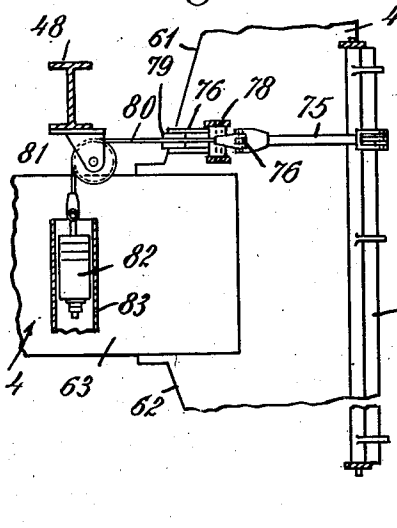


Fig. 7

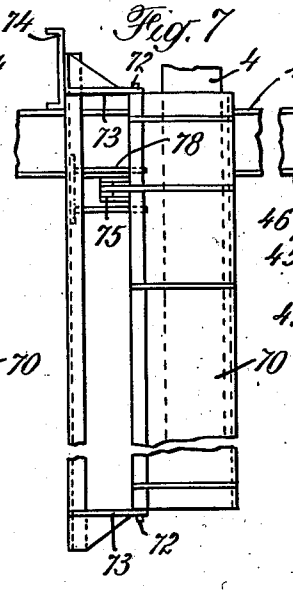
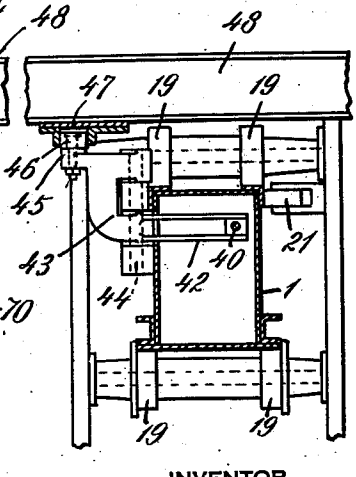


Fig. 5.



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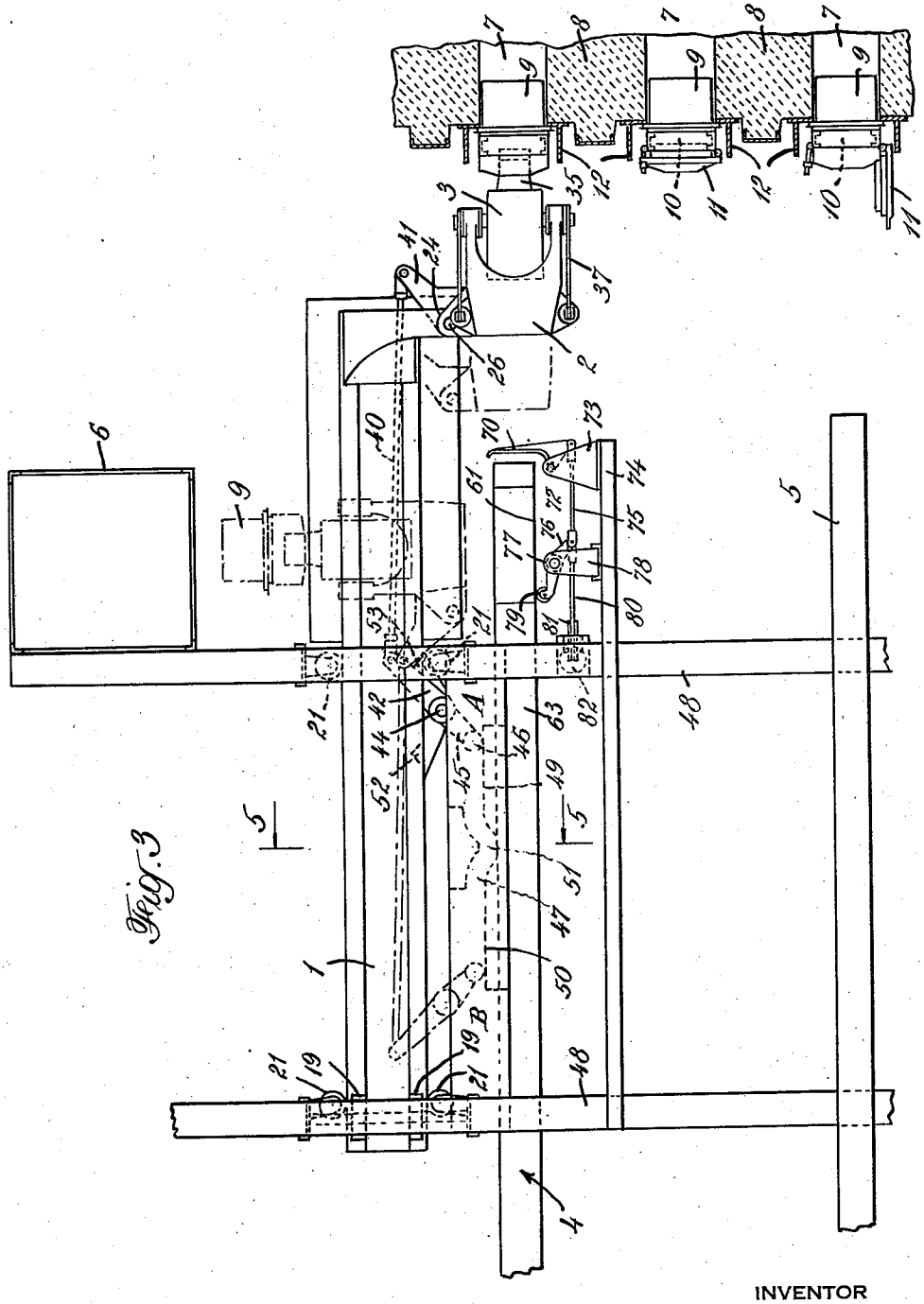


Fig. 3

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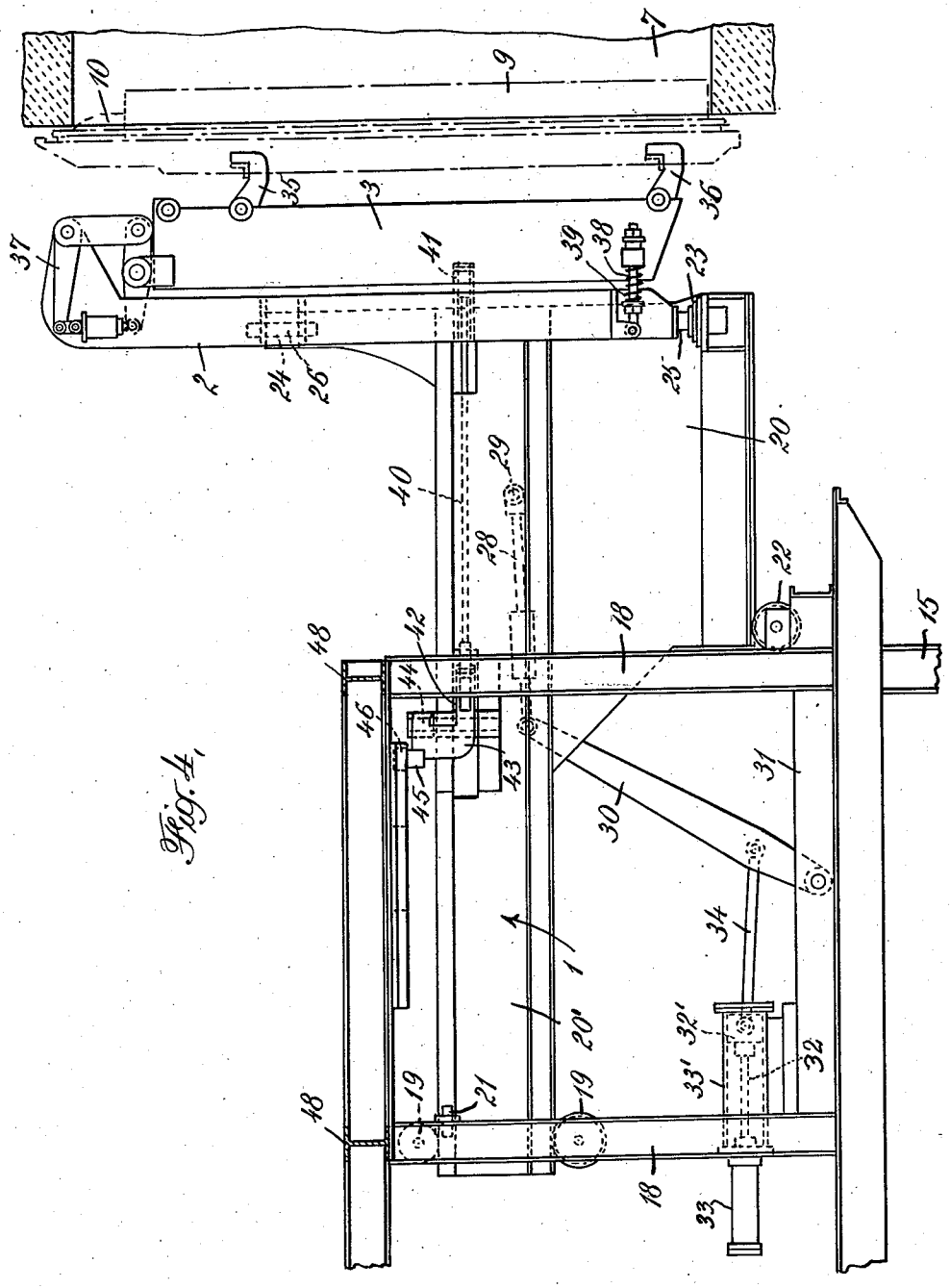


Fig. 4.

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2,391,214

UNITED STATES PATENT OFFICE

2,391,214

COMBINATION COKE OVEN DOOR-HANDLING, PUSHING, AND LEVELING MACHINE

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Application May 6, 1944, Serial No. 534,500

11 Claims. (Cl. 202—248)

The present invention relates to a machine for removing and replacing coke oven doors to facilitate the cleaning thereof. More specifically, this invention pertains to a combined coke oven door-handling, pushing and leveling machine involving a carriage traveling on tracks disposed parallel to a coke oven battery on the coke side thereof and designed so that without moving the carriage, once the machine is spotted before a given coking chamber, the machine operates to (*a*) move the door from the coking chamber to a door-cleaning position, (*b*) push the charge of coke from that coking chamber, (*c*) level a charge of coal in another coking chamber and (*d*) return the door to door-closing position.

It is not unusual in modern coke oven batteries to have the coking chambers and the doors therefor of a height of about 13′ or even higher. In the operation of such batteries it is the practice to employ a door-handling machine on which one or two operators are stationed whose duty it is to clean the doors as they are moved from the coking chambers. To permit these operators to reach both the top and bottom portions of the door, it is conventional practice to provide two platforms connected by a stairway. If a single door cleaner is employed, he must ascend this stairway to reach the upper platform from which the upper portion of the door is accessible to him and descend this stairway to reach the lower platform where the lower portion of the door is accessible to him. This is both time-consuming and arduous.

In the operation of large batteries, for maximum efficiency it is desirable to operate the door-handling machine substantially continuously, i. e., after the door has been removed, cleaned and returned to one coking chamber, the machine is immediately moved to another chamber, where these operations are repeated. However, with coke oven door-handling machines as heretofore constructed, it is necessary to use two door-cleaning operators, one on each platform, or, if a single operator is used, to employ a pushing schedule such that the door-handling machine is disposed for an inordinately long time interval before any given coking chamber to be pushed since the operator must be allowed sufficient time to ascend and descend the stairway connecting the platforms so he can clean both the top and lower portions of the door. Furthermore, in such machines the upper platform is usually disposed intermediate the top and bottom of the door, interfering with the satisfactory cleaning of the intermediate portion of the door opposite this platform.

It is an object of this invention to provide a door-handling machine which is constructed and designed to facilitate cleaning of the door, permitting the accomplishment of this task by a single operator more quickly and efficiently than with prior known designs of door-handling machines.

Another object of this invention is to provide a combined door-handling and pusher machine in which workmen on the machine are protected against the radiant heat emanating from the face of the hot pusher when it is retracted from a coking chamber.

Still another object of the invention is to provide a combined coke oven door-handling, pushing and leveling machine of durable construction, which machine, once spotted before a given coking chamber, functions to remove the door from that chamber, push the coke therefrom, replace the door, and level a charge of coal in another coking chamber, all without requiring any movement of the carriage on which these instrumentalities are mounted. Still another object of the invention is to provide such combined coke oven door-handling, pushing and leveling machine with facilities for quickly and efficiently cleaning the door by a single operator after it is removed from the coking chamber, which facilities conserve the energy of the operator whose duty it is to clean the door.

Other objects and advantages of this invention will be apparent from the following detailed description thereof.

The present invention comprises essentially a coke oven door-handling machine involving a carriage, a door-engaging head on the cariage movable to engage and carry the weight of the door and move it to a door-cleaning position, and a vertically movable platform or elevator on the carriage disposed near the door-cleaning position. Movement of this platform or elevator is under the control of the operator whose duty it is to clean the door. Thus, the operator, while on the platform or elevator, can move it to any desired level to effect ready and efficient cleaning of the door throughout the entire height thereof.

A more specific embodiment of this invention comprises a carriage movable on tracks running parallel to the length of the coke oven battery on the coke side thereof, a reciprocating ram on the carriage, a door-engaging head pivoted on the ram, a pusher disposed in longitudinal

alignment with the door-engaging head when it is in position to engage the door of a coking chamber, operating mechanism for the pusher and ram constructed and arranged so that when the ram is retracted the door-engaging head carrying the door is swung through a 90° arc to a door-cleaning position, thereby moving the head and door out of the path of movement of the pusher and permitting entry of the pusher into the coking chamber to push the coke therefrom. This specific construction may be and preferably is combined with a vertically movable platform or elevator on which a single door cleaning operator may be stationed, as hereinabove described. Furthermore, the machine may be and preferably is provided with a leveler disposed in spaced relation to the pusher so that once the machine is spotted before a coking chamber the door may be removed therefrom, the door cleaned, coke pushed from the chamber, the door returned to door-closing position and a charge of coal leveled in a different coking chamber, all without moving the carriage from the aforesaid spotted position. Preferably, a pivoted shield is disposed on the carriage to substantially completely cover the face of the pusher when it is retracted from a coking chamber to shield the operators on the machine from the radiant heat emanating from the face of the pusher. This shield is provided with operating mechanism to automatically effect movement thereof out of the path of movement of the pusher upon initiation of movement of the pusher into a coking chamber.

In the accompanying drawings forming a part of this specification and showing for purposes of exemplification a preferred embodiment of this invention, but without limiting the claimed invention specifically to such embodiment:

Figure 1 is a side elevation of a machine embodying the invention, parts being broken away to permit showing of the machine on a somewhat larger scale than would otherwise be possible;

Figure 2 is a front elevation of the machine shown in Figure 1 with the door shown in door cleaning position and the shield in front of the pusher omitted in the interests of clarity;

Figure 3 is a plan view of this machine, parts being broken away in the interest of clarity;

Figure 4 is a side elevation showing a portion of the ram and of the frame carrying the door-engaging head, which frame is pivotally secured to the ram;

Figure 5 is a vertical section taken in a plane indicated by the line 5—5 of Figure 3, showing the operating mechanism for effecting the swinging movement of the frame carrying the door-engaging head;

Figure 6 is a fragmentary side elevation showing the mechanism for effecting swinging movement of the shield disposed in front of the pusher; and

Figure 7 is a fragmentary front elevation of the shield disposed in front of the pusher.

The arrangement of the main parts of the machine and the relationship thereof to the coke oven battery is best shown in Figure 3.

It will be noted from this figure the machine comprises four main parts, namely, (*a*) a reciprocating ram 1 having pivotally mounted thereon a frame 2 carrying a door-engaging head 3, (*b*) a reciprocating pusher 4 spaced from the ram 1, (*c*) a reciprocating leveler bar 5, spaced from the pusher 4, and (*d*) a vertically movable platform or elevator cage 6, in which a vertically movable platform or elevator under the control of a door-cleaning operator can be moved to any desired height to facilitate cleaning of the door when it is moved to door-cleaning position shown in dotted lines on Figure 3. Each of these main parts, together with the operating mechanism therefor, will be hereinafter described in greater detail.

Referring to Figure 3, it will be noted the coke oven battery is of conventional construction and comprises alternating coking chambers and heating walls, indicated by the reference characters 7 and 8 respectively, shown fragmentarily in this view. The mouth of each coking chamber is adapted to be closed by a door 9, which may be of any conventional design such as the well known self-sealing doors, and which has near the upper portion thereof a leveler opening 10 adapted to be closed by a leveler door 11. The ends of the heating walls are provided with the usual armor or flash plates and with door frames 12. Running parallel to the length of the battery, as shown in Figure 1, are tracks 13 on which travel the wheels 14 of the carriage 15 of the machine. In Figure 1 of the drawings a motor 16 is shown for driving a shaft 17, which in turn drives through suitable gearing connections not shown, the wheels 14 traveling on tracks 13 to move the carriage from one spotted position before a coking chamber to another such position before another coking chamber.

Disposed on the carriage 15 are standards 18 in which are mounted rollers 19 for supporting the weight of and guiding reciprocating ram 1. The ram is shaped as shown in Figure 4, i. e. so that the forward portion 20 extends below the rear portion 20'. Rear portion 20' is confined against movement in a vertical direction by the rollers 19 shown in Figure 4, and against movement in a horizontal direction by rollers 21 (Figures 3 and 5) mounted so as to engage the sides of the ram. The bottom of the forward portion 20 of the ram rests and travels on the guide roller 22, suitably journaled in bearing supports on the carriage.

The forward portion 20 of ram 1 is provided with upper and lower bearings 23, 24 for the pivot pins 25, 26 on one side of the frame 2. As will be seen from Figure 4, pivot pin 25 is disposed at the base of frame 2 and pivot pin 26 extends from a point of the frame somewhat below the top. The frame 2 is thus pivotally mounted on ram 1, so that it can swing in bearings 23, 24 through a 90° arc, i. e. from the full to the dotted line position shown in Figure 3.

Reciprocation of the ram 1 is effected by a connecting rod 28 having one end 29 pivotally secured to the ram 1 and the other end pivotally fastened to one end of a lever 30. The other end of lever 30 is pivotally mounted in the channel beam 31 on the carriage 15. A piston (not shown) of hydraulic cylinder 33 mounted on the carriage 15 is connected by a piston rod 32 to crosshead 32' which in turn is connected by rod 34 to lever 30; crosshead 32' is movable in guide 33'. Reciprocation of the piston rod 32 by the hydraulic cylinder 33 effects swinging movement of the lever 30 about its lower pivot, thereby reciprocating the ram 1 through the connecting rod 28.

The door-engaging head 3 is provided with top and bottom pivoted hooks 35, 36 for engaging the doors 9 to lift and carry the weight of the doors. Movement of the hooks 35, 36 about their pivots is effected by suitable mechanism which is conventional and is not shown on the

drawing in the interests of clarity. When these hooks are actuated to engage and lift the door the seal between the door and door frame is broken and the weight of the door transferred to the hooks on the door head 3. The upper portion of the head is suspended through a suitable linkage mechanism indicated by the reference character 37 from the frame 2. The lower portion of the head 3 is connected with the frame 2, through a nut and bolt connection indicated generally by the reference character 38, a spring 39 being provided on the bolt for cushioning the movement of the lower portion of the head 3 relative to the frame 2. The design of the door head and the specific connection between it and the pivoted frame are not features of this invention. Any suitable door head and means for connecting it to the frame 2 may be used.

For effecting swinging movement of the frame 2 and the associated head 3 carrying a door 9 as ram 1 is retracted, the mechanism shown in Figures 3, 4 and 5 may be employed. This mechanism comprises a connecting rod 40 which has one end pivotally secured to a lever 41 fixed to an intermediate portion of frame 2 and has the other end pivotally fastened to arm 42 of a second lever. This second lever is shaped in the form of a bell crank, as shown in Figures 4 and 5; the intermediate portion 43 thereof is pivoted on pin 44 disposed in suitable bearings on the ram 1. The other arm 45 of the bell crank lever is provided with a cam roller 46 which travels in a cam track 47, fixed to cross bars 48 (see Fig. 5) of the carriage. This cam track is disposed in a horizontal plane and comprises two linear or straight portions 49, 50 connected by an arcuate or curved portion 51 (Figure 3). It is important to note the cam track is fixed to the carriage and does not move with ram 1 as it is reciprocated; bell crank lever 42 and its associated mechanism, however, moves with the ram 1. Mounted on ram 1 are two stops 52, 53 shown in dotted lines on Figure 3, the function of which will be described hereinafter.

In operation, with the ram 1 in position such that the door-engaging head 3 engages the door in a coking chamber, the cam roller 46 is positioned in the straight portion 49 of the cam track 47 with the lever arm 42 in contact with stop 53, as shown in the position of lever arm 42 indicated by reference character A in Figure 3. As the ram moves from right to left viewing Figure 3, the cam roller 46 travels in the straight horizontal portion 49 of the cam track 47. During the initial portion of the movement there is no change in the relative position of the lever arm 42 and the connecting rod 40 so that no swinging movement is imparted to the frame 2. Upon further movement of the ram 1 the cam roller 46 reaches the curved portion 51 of the cam track, which causes the bell crank lever to move about its pivot 44 from right to left, viewing Figure 3. In the continued retraction of the ram 1, the bell crank lever is swung about pivot 44 until arm 42 engages the stop 52, the bell crank remaining in the position indicated in dotted lines in Figure 3 as the cam roller travels on the straight portion 50 of the cam track. The afore-described movement of the bell crank lever 42 about pivot 44 as the cam roller moves through portion 51 of the cam track moves the connecting rod 40 relative to the ram 1 and effects a swinging of the door head through a 90° arc from a position directly in front of the coking chamber to which the frame carrying the door head and door have been moved upon initial retraction of the ram to the door-cleaning position shown in dotted lines in Figure 3. Upon completion of the retraction movement of the ram 1, lever 42 is in position indicated by reference character B on Figure 3.

When the ram is reciprocated in the opposite direction, the movements hereinabove described are reversed, the bell crank lever and connecting rod 40 being moved as the cam roller moves through the portion 51 of the cam track, from left to right, to swing the frame carrying the door head and door from door-cleaning position shown in dotted lines to the full-line position in front of the coking chamber. Continued movement of the ram 1 brings the door into position to close the coking chamber opening.

Mounted on the carriage opposite the door when it is disposed in door-cleaning position, as shown in dotted lines of Figures 2 and 3, is the elevator cage 6. This cage may be defined by suitable channel bars secured as by welding or bolting to the framework of the carriage 15. Disposed in the cage 6 is a vertically movable platform 55 arranged to be raised and lowered within the cage 6 under the control of an operator stationed on this platform. One suitable mechanism for effecting such raising and lowering is shown in Figure 2 of the drawings. It comprises a fixed supporting member 56, secured to the bottom of the platform and extending downwardly therefrom. A hydraulic cylinder 57 is mounted on the carriage beneath the platform 55 and is provided with a piston having journalled in the upper portion thereof a pulley 58. A chain or wire rope 59 has one end secured to the fixed standard 56, and the other end to a fixed collar member 60 secured to the cylinder 57 on the carriage. The intermediate portion of this chain or rope passes over the pulley 58. Thus, when the piston is moved upwardly the pulley functions to cause the wire rope 59 to travel thereover in a counter-clockwise direction, effecting raising of the platform 55. Operation of the hydraulic cylinder to cause the piston to descend causes the wire rope to travel thereover in a clockwise direction to lower the platform 55.

The admission of pressure fluid to the hydraulic cylinder is controlled by valve 60 of any conventional type, disposed in the elevator cage 6 under the control of the operator on the platform, so that by manipulation of this valve the operator can effect raising or lowering of the platform as desired. Since the operator can determine the position to which the platform is moved, he can dispose the platform at any desired height to reach any portion of the door to effect cleaning thereof. If the operator so desires, he can arrange to have the platform ascend or descend slowly while he is cleaning the door, thus effecting the cleaning while the platform is in motion.

The pusher 4 may be of conventional shape, having the forward portion of a height approximately equal to the height of a coking chamber and having inclined sides 61, 62 (Figure 1) connecting the forward portion with the longitudinal beam 63 of the pusher. This beam is arranged to travel between rollers 64, 65 mounted in standards 66 secured to the carriage 15. Reciprocation of the pusher 4 may be effected by a motor shown conventionally at 67, which through reduction gearing drives a gear 68 meshing with teeth 69 on the under side of the beam 63.

A shield 70 is pivotally mounted on the carriage to cover the face of the pusher 4 when it

is in the retracted position shown in Figure 3 and thereby protect any operator who has occasion to walk in front of the pusher, say, an operator who may be on the platform 71 disposed in front of the coking chamber, from the heat emanating from the face of the hot pusher. The shield is so dimensioned that it substantially completely covers the face of the pusher. It is pivoted at 72 (Figure 3) in supports 73 secured to cross bars 74 forming part of the structural framework of the carriage 15. A connecting rod 75 is secured to one end of the shield 70, and has the other end secured to a lever 76 pivoted at 77 in a support 78 and having its free end provided with a roller 79 arranged to engage the inclined portion 61 of the pusher when it is in the retracted position shown in Figure 3.

A rope or wire cord 80 (Figure 6) is fastened to the connecting rod 75, passes over a pulley 81 and connects with a counterweight 82 disposed in a suitable housing 83. The counterweight 82 effects swinging of the shield 70 about the pivot 72 from the path of movement of the pusher when the roller 79 no longer engages the inclined side wall 61 of the pusher due to movement of the pusher into the coking chamber. Upon retraction of the pusher from the coking chamber the inclined side 61 engages the roller 79 to swing the shield to a position in front of the pusher face, as shown in Figure 3.

A leveler bar 5 is mounted in the upper portion of the machine in suitable standards, indicated generally by the reference character 84, each standard having mounted therein lower supporting rolls 85. Also mounted in these standards, as shown in Figure 2, is a drive shaft 86 having mounted thereon a pair of flanged rolls 87 for engaging the upper corners of the leveler bar. A drive sprocket 88 is keyed to the drive shaft 86 and a chain 89 (Figure 1) passes over the drive sprocket 88 and around an idler sprocket 88a located toward the rear of the machine. The ends of the chain are fastened to the leveler bar at 88b. As appears from Figure 1 the lower part of the chain rests on the leveler bar 5 while the upper part of the chain rests on idler rolls 88c mounted on shafts in standards 84, each shaft also having a pair of flanged rolls thereon engaging the upper corners of the leveler bar. Drive shaft 86 is driven by a motor 90 through suitable gearing (not shown). Thus, through the sprocket 88 keyed on drive shaft 86, chain 89 is driven to move the leveler bar into a coking chamber. Reversal of the direction of movement of the chain by reversing the motor retracts the leveler bar from the chamber. The aforedescribed mechanism for reciprocating the leveler bar represents a well known form of drive for such bar, and per se is not a part of this invention. Other suitable drive mechanism may be employed for this purpose.

It will be noted from Figures 2 and 3 that the leveler bar is spaced horizontally from the pusher a distance such that the pusher is in position to push a charge of coke from one chamber while the leveler is in position to level a charge of coal in a different coking chamber without moving the carriage 15. In the embodiment shown in Figure 3, the distance between the longitudinal center lines of the pusher and the leveler is the same as the distance between the longitudinal center lines of two coking chambers separated by an intervening coking chamber. The spacing of the pusher and the leveler bars may be different than that shown on the drawings; if desired, the leveler may be positioned relative to the pusher so as to permit pushing a charge of coke from one coking chamber and level a charge of coal in a contiguous coking chamber without moving the carriage, or level a charge of coal in a coking chamber spaced, say, two or more coking chambers from that from which the charge of coke is being pushed. The spacing shown on the drawings, however, is preferred.

In operation, the carriage 15 is spotted before a coking chamber 7. Ram 1 is then moved so that the hooks 35 and 36 are brought into engagement with the keepers on the door and the mechanism on the door head is actuated, as is well known, to release the tension exerted by the latch bars holding the door in place and to break the seal between the door and door frame. Thereafter, the ram 1 is retracted by actuation of hydraulic cylinder 33 as hereinabove described. During the initial movement, frame 2, head 3 and door 9 move in a straight line away from the coking chamber. On continued retraction, cam roller 46 enters curved portion 51 of cam track 47 swinging, as hereinabove described, the frame 2, head 3 and door 9 through a 90° arc to door-cleaning position. The operator on vertically movable platform 55 cleans the door, shifting the position of the platform by manipulation of valve 60 so that he reaches all portions of the door requiring cleaning.

While the operator is thus engaged in cleaning the door, another operator disposed in the control cab (not shown) of the carriage energizes the motor 67 to cause the pusher 4 to push coke from the coking chamber from which the door has just been removed. It will be noted that the swing of the frame, door head and door to door-cleaning position removes these parts from the path of movement of the pusher into the coking chamber. As the side 61 of the pusher moves away from the roller 79 the counterweight 82 effects swinging of the shield 70 out of the path of movement of the pusher. Upon retraction of the pusher, side 61 engages roller 79 to swing the shield 70 back in front of the face of the pusher. Movement of ram 1 toward the coking chamber causes the frame 2, head 3 and door to be swung back to position in line with the door opening and, as movement of the ram 1 is continued, the door is brought into sealing engagement with the door frame.

Without moving the carriage 15, and during or immediately after the above-described operations, the leveler bar 5 may be reciprocated by its actuating mechanism hereinabove described to level a charge of coal previously delivered to the coking chamber into which the leveler bar is positioned to enter.

It is to be understood that this invention is not restricted to the present disclosure otherwise than as defined by the appended claims.

What is claimed is:

1. In a coke oven door-handling machine, in combination, a carriage movable on tracks running parallel to the length of the coke oven battery, a reciprocating ram, a door-engaging head pivoted on said ram and arranged to engage and carry the weight of a door, means for reciprocating said ram to retract the head and door carried thereby from a coking chamber normally closed by said door and to return the head and door to door-closing position, means for swinging the door-engaging head and the door carried thereby through a 90° arc during the said retraction of said ram to move the door to a door-cleaning

position, a vertically movable platform on said carriage near the said door-cleaning position, and means to raise and lower the platform so that an operator may readily clean the door when moved to said door-cleaning position.

2. In a coke oven door-handling machine, in combination, a carriage, a door-engaging head on said carriage movable to engage and carry the weight of a door and move the door to a door-cleaning position, a vertically movable platform on said carriage near the said door-cleaning position, means to raise and lower the platform so that an operator thereon can readily clean the door when moved to said door-cleaning position, a pusher on the carriage and a leveler on the carriage spaced from the pusher so that without moving the said carriage the pusher can push coke from one coking chamber and the leveler level a charge of coal in another coking member.

3. In a coke oven door-handling machine, a carriage, a reciprocating ram on said carriage, a door-engaging head pivotally mounted on said ram, a reciprocating pusher disposed in longitudinal alignment with the door-engaging head when said head is in position to engage a door on a coking chamber, means for moving the door-engaging head about its pivot on said ram out of the path of movement of said pusher, and a leveler bar on a carriage spaced from the pusher so that without moving the carriage the pusher can push coke from one coking chamber and the leveler level a charge of coal in another coking chamber.

4. In a coke oven door-handling machine, in combination, a reciprocating pusher, a pivoted shield in front of said pusher adapted to substantially completely cover the face of the pusher, and means for swinging said shield out of the path of movement of said pusher upon initiation of movement of the pusher into a coking chamber.

5. In a coke oven door-handling machine, in combination, a carriage, a door-engaging head on said carriage movable to engage and carry the weight of a door and move the door to a door-cleaning position, a reciprocating pusher, a pivoted shield in front of said pusher adapted to substantially completely cover the face of the pusher, and means for swinging said shield out of the path of movement of said pusher upon initiation of movement of the pusher into a coking chamber.

6. In a coke oven door-handling machine, in combination, a carriage, a door-engaging head on said carriage movable to engage and carry the weight of a door and move the door to a door-cleaning position, a vertically movable platform on said carriage disposed near the said door-cleaning position, means to raise and lower the platform so that an operator thereon can readily clean the door when it is moved into said door-cleaning position, a reciprocating pusher, a pivoted shield in front of said pusher adapted to substantially completely cover the face of the pusher, and means for swinging said shield out of the path of movement of said pusher upon initiation of movement of the pusher into a coking chamber.

7. In a coke oven door-handling machine, in combination, a carriage, a door-engaging head on said carriage movable to engage and carry the weight of a door and move the door to a door-cleaning position, a vertically movable platform on said carriage near the said door-cleaning position, means to raise and lower the platform so that an operator thereon can readily clean the door when moved to said door-cleaning position, a pusher on the carriage and a leveler on the carriage spaced from the pusher so that without moving the said carriage the pusher can push coke from one coking chamber and the leveler level a charge of coal in another coking chamber, a pivoted shield in front of said pusher adapted to substantially completely cover the face of the pusher, and means for swinging said shield out of the path of movement of said pusher upon initiation of movement of the pusher into a coking chamber.

8. In a combined coke oven door-handling, pushing and leveling machine, in combination, a carriage; a reciprocating ram on said carriage; a door-engaging head pivotally mounted on said ram movable to engage and carry the weight of the door and upon reciprocation of the ram away from a coking chamber normally closed by said door swing said door through a 90° arc to a door-closing position; a vertically movable platform on said carriage opposite the door-cleaning position; means to raise and lower the platform so that an operator thereon can readily clean the door when it is swung to said door-cleaning position; a reciprocating pusher disposed parallel with said ram and positioned in longitudinal alignment with the door-engaging head when said head is in position to engage a door on a coking chamber, movement of said door to the aforesaid door-cleaning position removing the said head and door from the path of movement of the pusher when it moves into said coking chamber to push the coke therefrom, and a leveler bar on the carriage spaced from the said pusher so that without moving said carriage the door may be removed from the coke side of a coking chamber, coke pushed from this chamber and the coal leveled in another coking chamber.

9. In a combined coke oven door-handling, pushing and leveling machine, in combination, a carriage; a reciprocating ram on said carriage; a door-engaging head pivotally mounted on said ram movable to engage and carry the weight of the door and upon reciprocation of the ram away from a coking chamber normally closed by said door swing said door through a 90° arc to a door-cleaning position; a vertically movable platform on said carriage opposite the door-cleaning position; means to raise and lower the platform so that an operator thereon can readily clean the door when it is swung to said door-cleaning position; a reciprocating pusher disposed parallel with said ram and positioned in longitudinal alignment with the door-engaging head when said head is in position to engage a door on a coking chamber, movement of said door to the aforesaid door-cleaning position removing the said head and door from the path of movement of the pusher when it moves into said coking chamber to push the coke therefrom, a pivoted shield in front of said pusher adapted to substantially completely cover the face of the pusher; means for swinging said shield out of the path of movement of said pusher upon initiation of movement of the pusher into a coking chamber; and a leveler bar on the carriage spaced from the said pusher so that without moving said carriage the door may be removed from the coke side of a coking chamber, coke pushed from this chamber and the coal leveled in another coking chamber.

10. In a coke oven door-handling machine, in combination, a carriage; a reciprocating ram; a door-engaging head supported on said ram so

that said head is movable through a 90° arc with the face of the door carried thereby maintained in a vertical plane; means for reciprocating said ram to retract the head and door carried thereby from the coking chamber; means for swinging the door-engaging head and the door carried thereby during the said retraction of said ram to move the door to a door-cleaning position; a vertically movable platform on said carriage near the said door-cleaning position, and means to raise and lower the platform so that an operator thereon may readily clean the door when moved to said door-cleaning position.

11. In a coke oven door-handling machine, in combination, a carriage movable lengthwise of the coke oven battery, a reciprocating ram mounted on the carriage, a door-engaging head carried by said ram and arranged to engage and carry the weight of a door, means for reciprocating said ram to retract the head and door carried thereby from a coking chamber normally closed by said door and to return the head and door to door-closing position, said head being swingably mounted on said ram to a door-cleaning position, a vertically movable platform on said carriage disposed near the said door-cleaning position and means to raise and lower the platform so that an operator may readily clean the door when moved to said door-cleaning position.

LOUIS WILPUTTE.