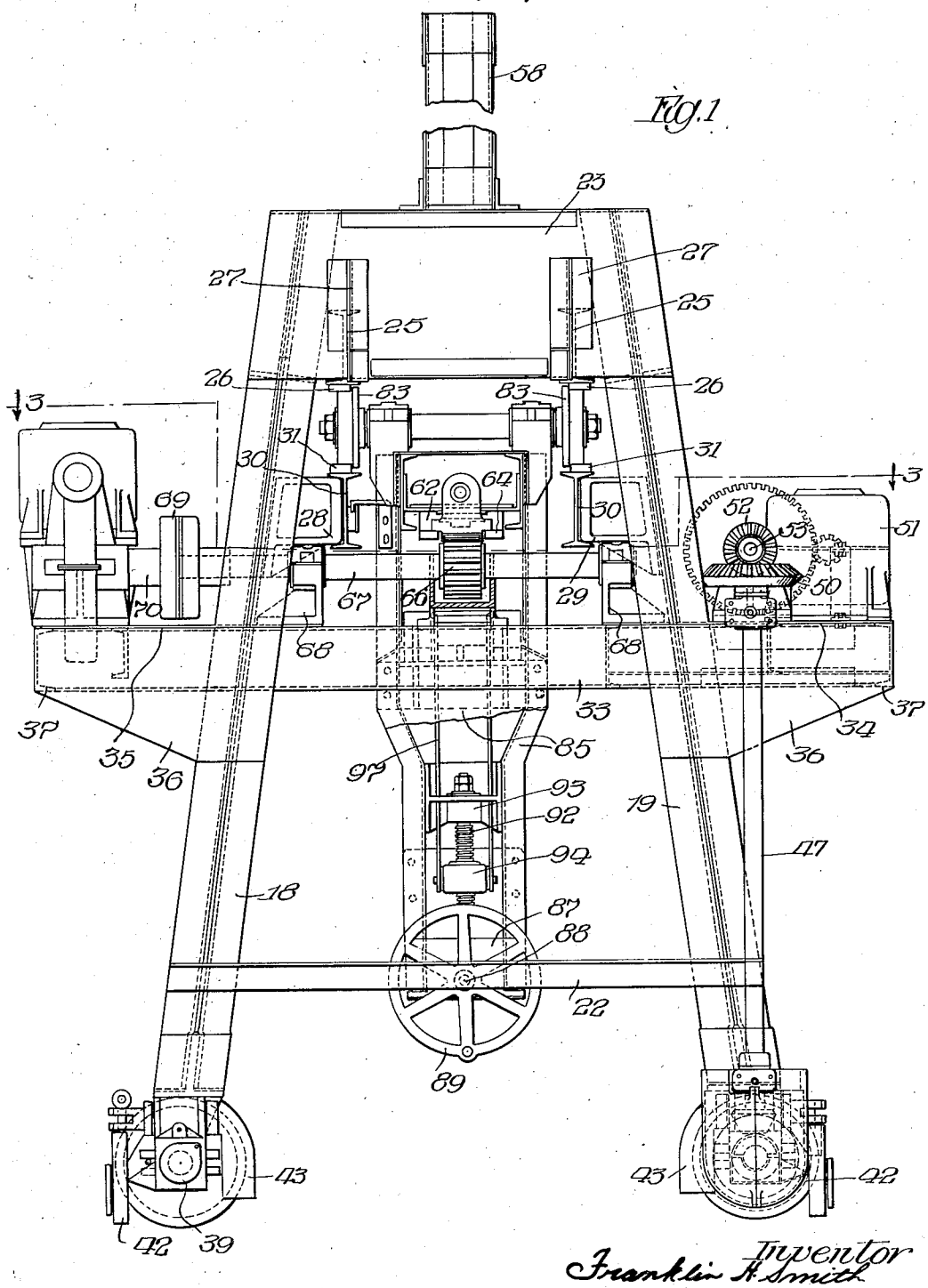
Sept. 8, 1925. 1,552,578

F. H. SMITH

COKE OVEN DOOR OPERATING MACHINE OR APPLIANCE

Filed July 31, 1920 3 Sheets-Sheet 1



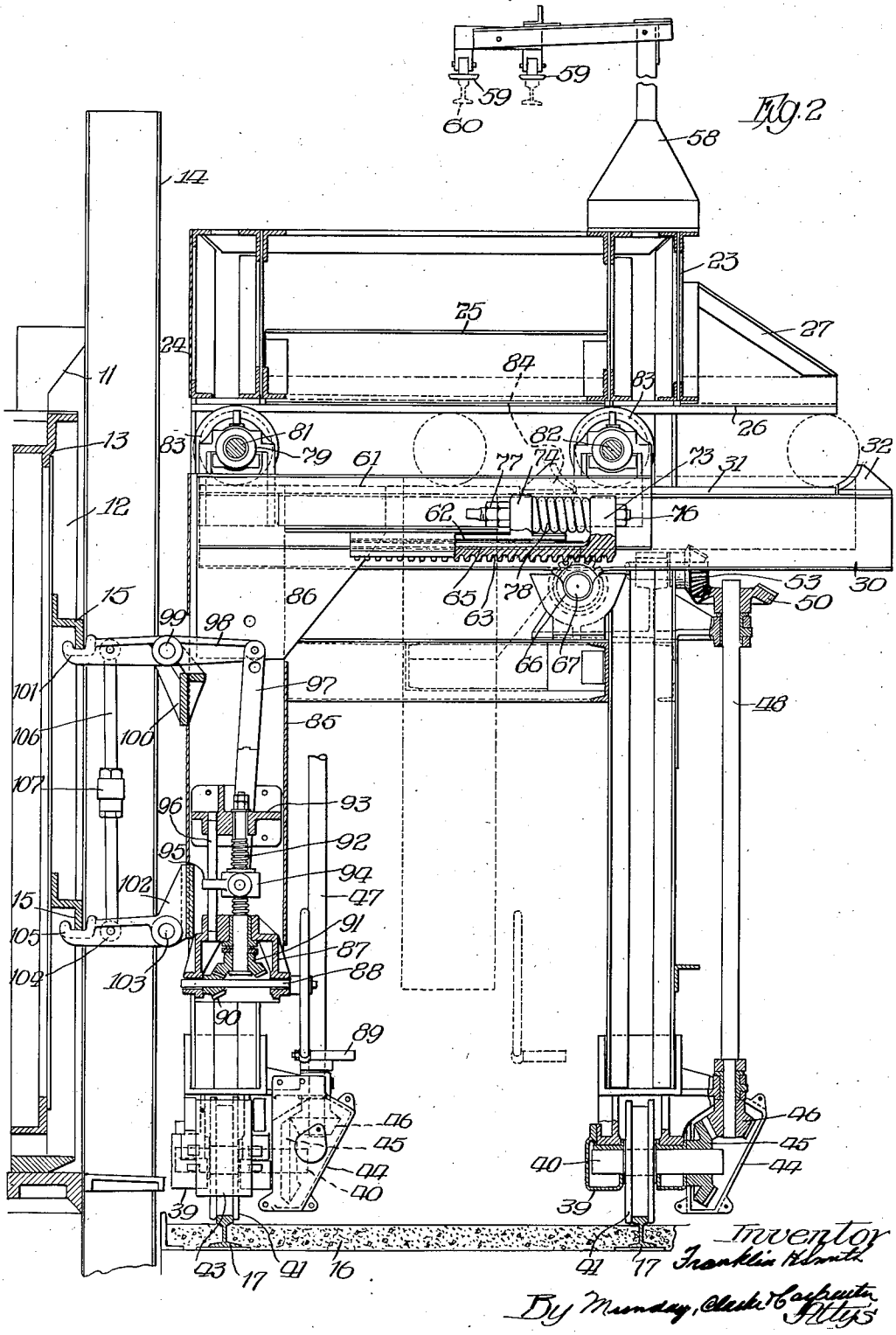
Inventor
Franklin H. Smith
By Munday, Clarke & Carpenter
Attys

Sept. 8, 1925. 1,552,578

F. H. SMITH

COKE OVEN DOOR OPERATING MACHINE OR APPLIANCE

Filed July 31, 1920 3 Sheets-Sheet 2



Inventor
Franklin H. Smith
By Munday, Clerk & Carpenter
Attys

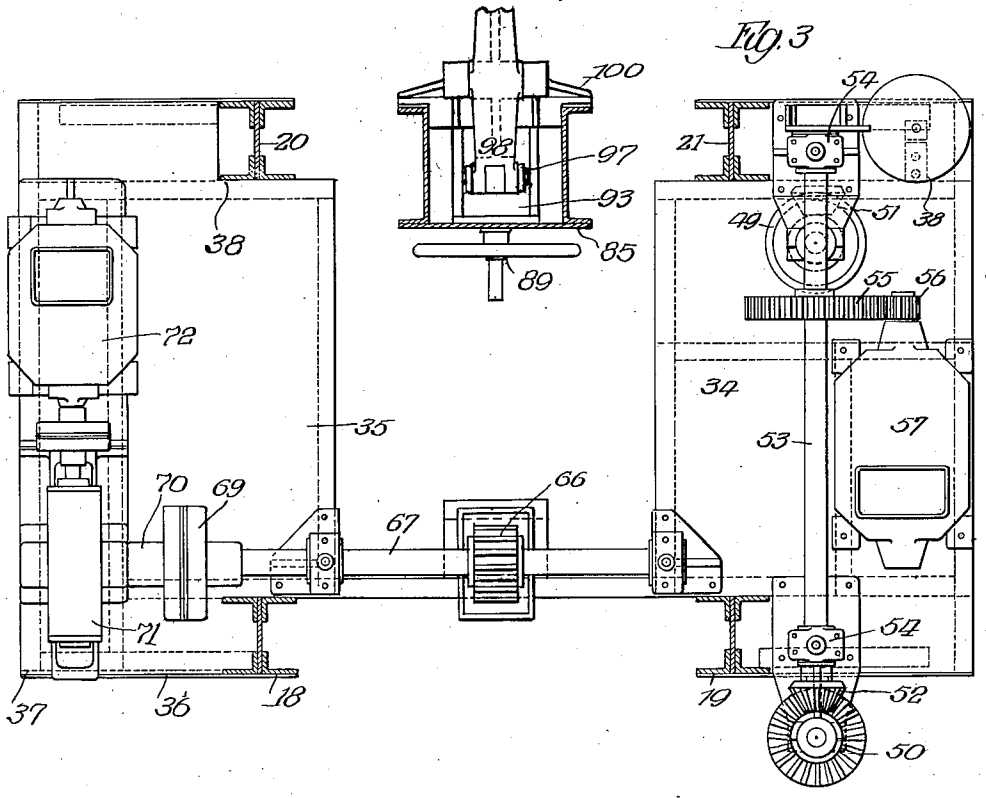
Sept. 8, 1925. 1,552,578

F. H. SMITH

COKE OVEN DOOR OPERATING MACHINE OR APPLIANCE

Filed July 31, 1920 3 Sheets-Sheet 3

Fig. 3



Inventor
Franklin H. Smith
By Munday Clarke & Carpenter
Attys

Patented Sept. 8, 1925. 1,552,578

UNITED STATES PATENT OFFICE.

FRANKLIN H. SMITH, OF PITTSBURGH, PENNSYLVANIA.

COKE-OVEN DOOR-OPERATING MACHINE OR APPLIANCE.

Application filed July 31, 1920. Serial No. 400,413.

To all whom it may concern:

Be it known that I, FRANKLIN H. SMITH, a citizen of the United States, residing in Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Coke-Oven Door-Operating Machines or Appliances, of which the following is a specification.

This invention relates generally to coke oven appliances and more particularly to an operating mechanism for coke-oven rams, such, for example, as may be used for operating the doors of coke ovens, although it will be understood that the invention is capable of other valuable applications than the specific use here mentioned.

One of the objects of the invention is the provision of a machine or appliance of this character embodying a crane-frame or supporting-carriage which travels on truck wheels below the coke-oven door, the carriage constituting the support for the entire ram and the various operating mechanisms or parts, thereby securing a simple, strongly braced and firmly balanced structure for suspension of the ram and other parts and eliminating the necessity of providing inconveniently elevated and expensive suspension ways for these appliances.

Another object of the invention is the provision of an exceedingly strong, simple and economical construction for supporting the ram and other mechanisms in which the ram is suspended from the crane, frame or carriage, thereby permitting an operator or attendant to walk without interference beneath the carriage along the track-way on which it runs and also affording easy access to the parts of the mechanism and that portion of the oven at which the carriage is stationed.

With the above and other objects in view, the invention consists in certain novel constructions, arrangements, and combinations of parts hereinafter described in a preferred form and particularly set forth in the claims at the end of the specification.

In the drawings:

Figure 1 is a front elevation of a coke oven appliance embodying a ram operating mechanism constructed in accordance with the present improvements.

Figure 2 is an end sectional elevation of the same, viewed from the left of Figure 1.

Figure 3 is a horizontal sectional elevation taken in planes indicated by the line 3—3 of Figure 1.

In the illustrated embodiment of the invention, the ram is employed for the purpose of lifting and moving away a coke-oven door from its place at the end of a coking chamber of an oven battery, and, for convenience, the present description of the ram and its associated parts will be confined to this use of the invention. Features of construction of the ram and other parts are readily susceptible of other uses, however, and it is manifest that the scope of the invention is by no means confined to the specific use and specific embodiment herein described.

Referring to the drawing, there is shown diagrammatically in Figure 2 the end of a coking chamber 11, said chamber being one of a plurality of coking chambers arranged side by side with and having the usual alternating heating walls constituted of flame flues intermediate adjacent coking chambers, the entire arrangement constituting a coking plant or battery of a type now well understood in the art. The ends of each coking chamber are closed by the usual doors, of which one is illustrated in section in Figure 2, and said door 12 is preferably constructed of a metallic outer shell 13 adapted to support the usual internal refractory lining. The end wall of the oven is reinforced by the usual buckstays 14. A pair of cleats 15, one located above the other, are secured by any suitable fastening means upon the outer face of each oven door 12, and said cleats are adapted to be engaged by the door lifting mechanism, whereby the door may be lifted and removed from its opening at the end of the coking chamber.

Extending transversely across the side wall of the oven or battery and supported in any suitable manner below the door 12 is a coke bench or platform 16 supporting a pair of track rails 17 which are preferably partially embedded in the masonry of the platform. These rails 17 constitute a track upon which is supported, below the oven door, the carriage or crane-truck, the latter supporting

the ram or door-lifting and operating parts and other mechanisms, and movable upon said track transversely of the oven into an operative position with respect to each one of the oven doors.

The crane-truck or carriage is preferably constructed of a frame comprising four uprights or I-beams 18, 19, 20, 21 arranged so that each pair of uprights 18—20, 19—21 incline inwardly and upwardly toward each other, as shown in Figure 1. Near their lower ends, uprights 18—19 are braced by a transverse horizontal bar 22; and the upper ends of uprights 18—19, 20—21 are respectively braced by front and rear transverse girder constructions including the front and rear exterior plates 23, 24. Connecting said transverse girder construction and rigidly secured thereto in any suitable manner is a pair of longitudinally-extending transversely spaced I-beams 25 beneath which is secured a pair of upper track rails 26, the function of which will hereinafter be described. These rails 26 extend beyond the front plate 23 and their projecting portions are secured to the under edges of a pair of triagular braces 27 secured to and projecting beyond the front face of the front plate 23.

Beneath said rails 26, and secured respectively to the two pairs of uprights 18—20, 19—21 are two pairs of inwardly projecting brackets 28, 29. Each pair of said brackets supports a longitudinally extending I-beam 30, and the pair of transversely-spaced I-beams 30 also project beyond the front face of the crane-truck frame and support on their upper edges throughout substantially their entire extent a pair of lower track rails 31. Mounted on the beams 30 beyond the outer extremities of the track rails 31 are stops 32 which serve to limit the movement of the ram-carrying truck away from the oven wall, as will presently appear.

Substantially intermediate the upper and lower ends of the uprights 18—19 and extending beyond both of said uprights is a horizontal transverse connecting beam 33. Supported upon this beam 33 are right and left hand tables 34—35 which respectively extend to the opposite extremities of the beam 33 and longitudinally between the two pairs of uprights 18—20, 19—21. The inner longitudinal edges of the two tables 34—35 are spaced apart a sufficient distance to permit the ram-carrying truck to clear the tables in its movements towards and from the oven. Connected to the tranverse edges of tables 34—35 and respectively to the several uprights 18—19—20—21 are vertical bracing plates 36. The tables are further braced by longitudinal beams 37 and short transverse beams 38, said beams 37 being connected to beam 33 and the beams 38 and the latter beams being connected to the uprights 20—21, as shown in Figure 3.

The four uprights of the crane-frame, or carriage are mounted upon flanged wheels which run on the rails 17 and for this purpose the lower ends of the several uprights are provided with journal boxes 39 in which are mounted the shafts 40 of the respective flanged wheels 41. If desired, the several journal boxes 39 may be equipped with scrapers 42 engaging the peripheries of the respective wheels and also with guards 43 disposed oppositely to said scrapers, as shown in Figure 1.

For the purpose of moving the crane-frame or carriage along the track to position it in front of the door of the desired coking chamber, the two right-hand wheels are power driven by means of the following drive connections: Positioned in front of the journal box 39 of each right-hand wheel 41 is a gear box 44 secured in any suitable manner to the end of its upright. The respective shafts 40 of these two wheels project within said gear boxes and are provided with bevel pinions 45 meshing with vertical bevel pinions 46 also located within said gear box. The inner bevel pinion 46 is carried at the lower end of a vertical shaft 47, and the outer bevel pinion 46 at the lower end of a vertical shaft 48. Said shafts 47—48 extend upwardly of the crane-frame and are respectively provided at the upper ends with bevel gears 49—50, the latter respectively meshing with bevel pinions 51, 52 fixed on a longitudinal shaft 53. Shaft 53 is journaled in bearing boxes 54 mounted upon the table 34 and is provided with a spur gear 55 which meshes with a spur pinion 56 on the armature shaft of a suitable electric motor 57. The motor 57 may be driven through any suitable circuit connections by current derived from the trolley pole 58 mounted on top of the crane-frame and having the usual contacting shoes 59 engaging conductors 60.

The ram-carrying truck, in the present embodiment, is for the purpose of first lifting an oven door to loosen it from its luting and then moving the door clear of the opening at the end of a coking chamber; it embodies, in its construction a horizontal portion provided with connections for moving the truck toward and from the oven and a vertical depending portion secured to the inner end of the horizontal portion and supporting the door lifting and engaging mechanism. The horizontal portion of the truck is constructed of a suitable metallic structural horizontal frame 61 beneath which is secured a horizontal longitudinal rack guide plate 62. The under surface of the latter is fashioned to form a suitable track for the upper surface of a rack 63, it being understood that the rack is movable relatively to the guide plate 62 and truck. Said rack is mounted beneath the guide

plate and is supported by a pair of horizontal longitudinal guides 64 secured to the opposite sides of the guide plate 62, as shown in Figure 1.

The under surface of the rack is formed with teeth 65 which are adapted to mesh with the teeth of a spur pinion 66 on a transverse driving shaft 67. This driving shaft is supported in bearing boxes 68 mounted upon the tables 34, 35 and passes to a flexible coupling 69 mounted over the table 35. Said flexible coupling 69 is connected by a stub shaft 70 with a reduction gearing 71 and the latter in turn is connected to the armature shaft of the truck-operating electric motor 72. Suitable circuit connections may be provided for driving the motor 72 by current supplied from the trolley pole 58.

The above described connections are for the purpose of driving the rack 63 longitudinally of the crane-frame both toward and from the oven. Said rack is provided with an upright bracket 73 and the guide plate 62 is provided with a similar bracket 74. These brackets are formed with registering holes for the reception of a bolt 75 which is passed loosely through said holes and secured at its opposite ends by nuts 76, 77. Encircling the bolt 75 between the two brackets is a yielding coil spring 78 of sufficient strength to transmit the motion of the rack to the guide plate and truck, and yet to permit a yielding movement of the guide plate relatively to the rack whenever the truck encounters an obstruction producing back stresses upon the truck.

The truck-frame or body 61 is provided with a pair of rear journal boxes 79 and with a pair of front journal boxes 80, in which pairs are respectively journaled two transverse shafts 81, 82. These shafts are each provided at their opposite ends with flanged rollers 83 which run on the upper and lower pairs of rails 26—31 during movement of the ram-carrying truck toward and from the oven. At the limit of their forward movement, the front rollers encounter the stops 32 and at the limit of their rearward or door ramming or closing movement, the rear rollers encounter similar stops 84 positioned on the pair of tracks 31.

The function of the door-operating ram, or door-lifting and operating mechanism is first to lift the oven door so as to loosen it from the luting around the door edges, next move the door away from the coking chamber to permit discharging of the coke, and, finally, when the discharging operation is completed, to ram the door back in its place in front of the coking chamber. The door-operating ram is suspended from the horizontal truck frame 61, being supported by the vertically-dependent portion of the latter. This vertically-dependent portion consists generally of a pair of transversely spaced vertical beams 85 connected at their upper ends to the frame 61 and braced by triangular plates 86.

Mounted between said beams 85 at their lower ends is a bearing bracket 87 in which is journaled a horizontal longitudinally disposed shaft 88 having, at its front end, a hand wheel 89, within convenient reach of an operator or attendant stationed on the platform 16 beneath the crane-frame. This shaft 88 is also provided with a bevel pinion 90 which meshes with a bevel pinion 91 mounted on the lower end of a vertical, axially-fixed, rotatable screw 92. The lower end of said screw is journaled in the bearing bracket 87 and the upper end thereof in an upper bearing bracket 93 secured between the vertical beams 85. Threaded on said screw is a trunnion 94 having an ear 95 which receives and is guided by a vertical rod 96 fixed in aligned sockets in the bearing brackets 87—93.

It will be understood that turning of the handwheel 89 through the intermediate gearing connections effects an axial movement of the trunnion 94 on the screw 92. Pivoted to the trunnion 94 is the lower end of a vertical link 97, the upper end of which is pivoted to the front end of a horizontal lever 98 fulcrumed intermediate its ends, at 99, on a bracket 100 secured to the beams 85. The rear end of the lever 98 is formed with a hook 101 adapted to engage the upper cleat 15 of the oven door. Secured to beams 85 beneath bracket 100 is a second bracket 102 on which is fulcrumed, at 103, the front end of an arm 104, the rear end of said arm 104 being provided with a similar hook 105 for engagement with the lower cleat 15 of the door. Preferably the lever 98 and arm 104 are connected by means of an adjusting rod 106 pivoted to the arm and lever and provided with the usual turn-buckle 107, the turning of which permits variation of the vertical distance between the arm and lever to accommodate them to the spacing of the cleats 15 on the oven door.

The operation of the above described machine or appliance is quite simple. The entire crane-truck with its various mechanisms is first propelled along the track 17 until it reaches a position in front of the desired oven door. The power for moving the crane-truck is then shut-off, and the ram-carrying truck is moved, between the uprights of the crane-truck, towards the oven door until the hooks 101—105 are positioned beneath the cleats 15. The power is then shut-off from the ram-carrying truck, and the hand-wheel 89 is operated to engage the hooks 101—105 with the cleats and shift the oven door vertically to loosen it from the luting. When this has been accomplished, the power is again applied to the ram-carry-

ing truck, but in the opposite direction to move the door away from the oven, the ram-carrying truck passing between the uprights of the crane-truck, as heretofore stated. After the door has been moved away from the coking chamber the required distance, the ram-carrying truck is stopped, and the entire crane-truck or carriage is moved away from the coking chamber opening preferably to an adjacent coking chamber, to permit discharge of the coke from the open chamber. All this time the door is supported by the ram. As soon as the coke discharging operation has ben completed, the crane-frame is moved back to bring the door into registry with the coking chamber opening, and the ram-carrying truck is propelled rearwardly to ram the door in the opening of the coking chamber. The door having been positioned in the coking chamber opening, the hooks are lowered out of engagement with the cleats, by operating the handwheel, and the entire crane-truck is moved away to the next door to be operated.

It will be noted that the entire crane-truck travels on a platform below the operated door and concurrently all the parts of the door-operating mechanism, or ram, are suspended from the crane-frame and are substantially clear of the platform 16. The use of an expensive suspension work is eliminated, and, at the same time, the lower portion of the framework of the crane-truck is clear of obstruction, permitting an attendant to walk beneath along the platform, without any interference whatsoever. Sufficient room is provided for the attendant to stand beneath the crane frame while operating the handwheel 89. As the entire ram and the other various operating mechanisms or parts are suspended from the carriage or crane frame, the necessity of providing expensive and inconvenient suspension-ways or heavy truck frames for the support of these parts, is obviated, and at the same time there is secured a simple, strongly braced and firmly balanced structure for the support of the ram and other parts.

The invention is hereinabove set forth as embodied in a particular form or construction but may be variously embodied within the scope of the claims hereinafter made.

I claim:

1. In combination with the coke bench of a coking retort oven, spaced rails thereon; a crane frame mounted on truck wheels, said wheels being supported by said rails; a door-operating ram suspended from the upper portion of said crane and movable within said crane towards and away from the doorway of an oven, and mechanism on said crane for propelling said crane along said spaced rails.

2. In combination with the coke bench of a coking retort oven, spaced rails thereon; a crane frame mounted on truck wheels, said wheels being supported by said rails; a door-operating ram suspended from the upper portion of said crane and movable within said crane towards and away from the doorway of an oven, and mechanism on said crane for propelling said crane along said spaced rails; a table extending horizontally at one side of said crane for supporting mechanism for propelling the crane along the spaced rails on the coke bench, and a table extending horizontally at the other side of said crane for supporting mechanism for moving said door-operating ram.

3. Means for opening and closing coke oven doorways comprising, a coke bench; a crane frame mounted on truck wheels supported on said coke bench for movement therealong; a door-operating ram suspended from said crane between the upright members of said crane, and means carried by said crane for propelling it along said coke bench and means carried by said crane for moving said door-operating ram toward and away from the doorway of said ovens.

4. In a coke oven door-operating mechanism, in combination: a coke bench; rails thereon; an upright crane truck supported entirely by and movable along the rails on said coke bench; a truck carried by said crane for removing, supporting and replacing the door of an oven, said door truck being movable towards and away from the doorway of an oven.

5. In a coke oven door-operating mechanism, in combination: a coke bench; rails thereon; an upright crane truck supported entirely by and movable along the rails on said coke bench; a truck carried by said crane for removing, supporting and replacing the door of an oven, said door truck being movable towards and away from the doorway of an oven; and a platform at one side of said crane near the upper portion thereof, said platform carrying means for moving said door truck, a platform on the other side of said crane, and oppositely disposed with respect to said first platform, said platform carrying means for propelling said crane along said spaced rails.

6. In a coke oven door-operating mechanism, in combination: a coke bench; rails thereon; an upright crane truck supported entirely by and movable along the rails on said coke bench; a truck carried by said crane for removing supporting and replacing the door of an oven, said door truck being movable towards and away from the doorway of an oven; a platform on one side of said crane near the upper portion thereof, said platform carrying means for moving said door truck; a platform on the other side of said crane, and oppositely disposed with respect to said first platform, said platform carrying means for propelling

said crane along said spaced rails; wheels on the legs of said crane engaging rails and gearing on the front and rear legs of said crane on the same side as said last mentioned platform; and connections between said gearing and the propelling means on the platform above for imparting motion to said wheels.

7. In a coke oven door-operating machine, in combination: a crane frame mounted on truck wheels and adapted to be supported by and propelled along the rails on a coke bench of a coking retort oven; a door-operating mechanism adapted to remove, support and replace the door of an oven, said door-operating mechanism being carried by the upper portion of said crane and movable, toward and away from the oven doorway, within the upright members of said crane.

8. In a coke oven door-operating machine, in combination: a crane frame mounted on truck wheels and adapted to be supported by and propelled along the rails on a coke bench of a coking retort oven; a door-operating mechanism adapted to remove, support and replace the door of an oven, said door-operating mechanism being carried by the upper portion of said crane and movable, toward and away from the oven doorway, within the upright members of said crane; a platform on one side of said crane near the upper portion thereof, said platform carrying means for propelling said crane; and a platform on the other side of said crane near the upper portion thereof, said platform carrying means for moving said door-operating mechanism toward and away from the oven doorway.

9. In a coke oven door-operating machine, in combination: a crane frame mounted on truck wheels and adapted to be supported by and propelled along the rails on a coke bench of a coking retort oven; a door-operating mechanism adapted to remove, support and replace the door of an oven, said door-operating mechanism being carried by the upper portion of said crane and movable, toward and away from the oven doorway, within the upright members of said crane; a platform on one side of said crane near the upper portion thereof, said platform carrying means for propelling said crane; a platform on the other side of said crane near the upper portion thereof, said platform carrying means for moving said door-operating mechanism toward and away from the oven doorway; and means carried by said door-operating mechanism for raising and lowering said door, relative to its frame, while said door is carried by said door-operating mechanism.

In testimony whereof I have hereunto set my hand.

FRANKLIN H. SMITH.