J. KRIPPNER.

COKE OVEN DOOR MACHINE.

APPLICATION FILED FEB. 16, 1920.

1,397,736. Patented Nov. 22, 1921.

3 SHEETS—SHEET 1.

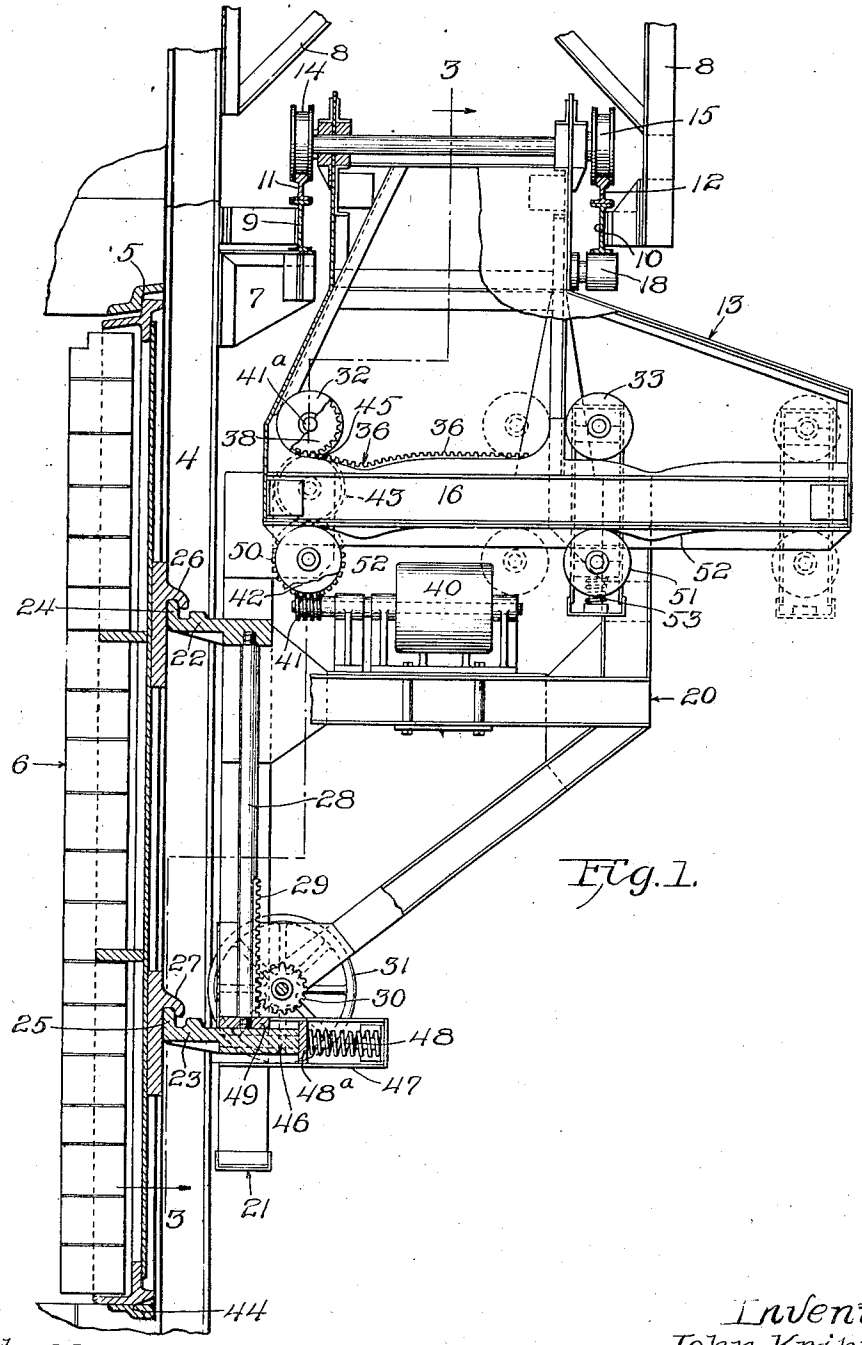


Fig. 1.

Witness:

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Inventor:

John Krippner

by Fleming & Fleming

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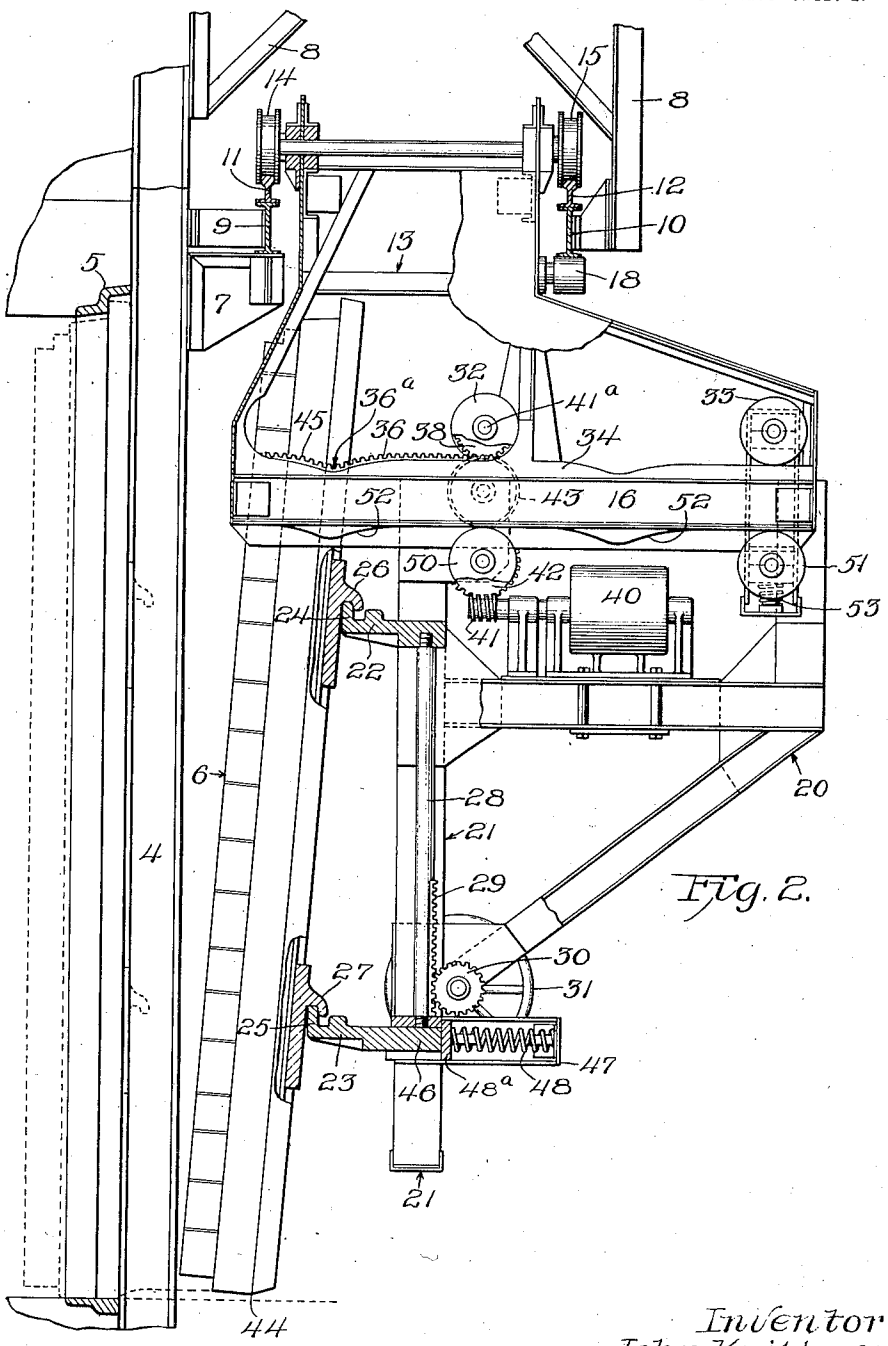
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3 SHEETS—SHEET 2.



Witness:

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3 SHEETS—SHEET 3.

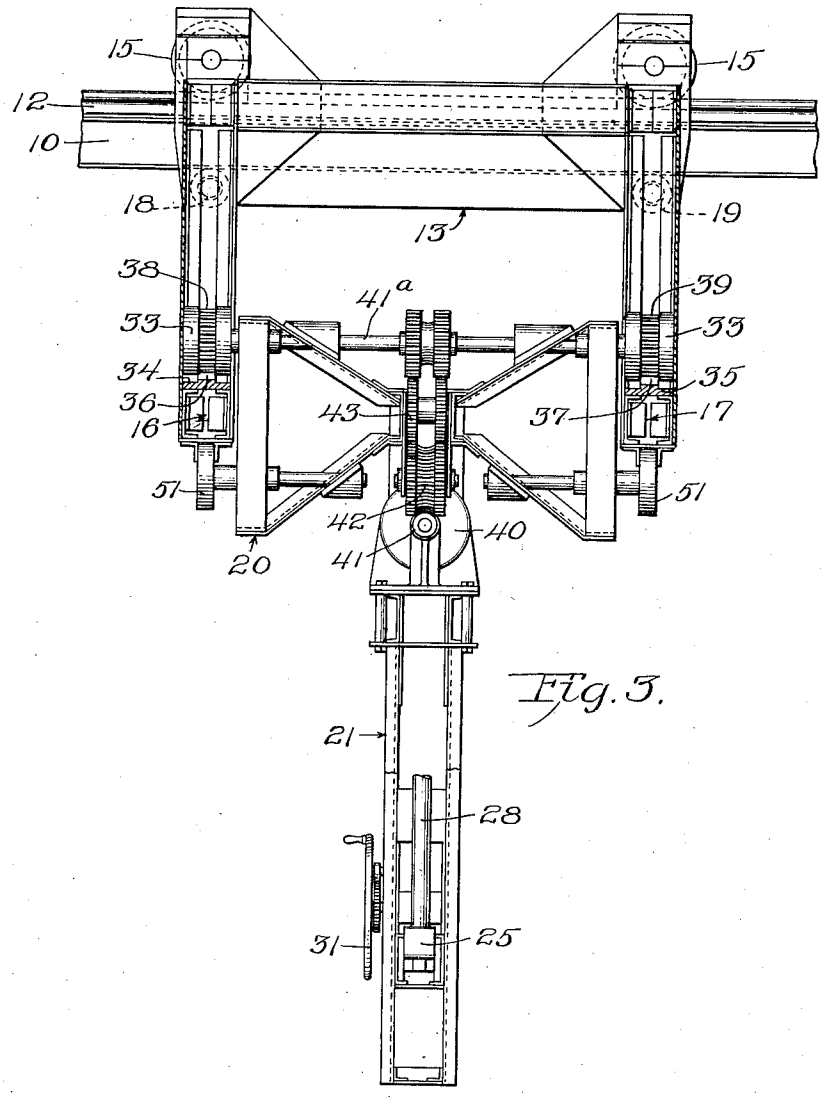


Fig. 3.

Witness:

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UNITED STATES PATENT OFFICE.

JOHN KRIPPNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO AMERICAN COKE & CHEMICAL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF MAINE.

COKE-OVEN-DOOR MACHINE.

1,397,736. Specification of Letters Patent. Patented Nov. 22, 1921.

Application filed February 16, 1920. Serial No. 359,121.

To all whom it may concern:

Be it known that I, JOHN KRIPPNER, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Coke-Oven-Door Machines, of which the following is a specification.

This invention has to do with certain improvements in coke oven door machines and the like. The construction of machine herein disclosed and particularly described is especially intended for use in connection with handling doors for coke ovens and the like, and for this reason I have illustrated and will describe the invention as particularly applied to this use. It will be understood, however, that in so doing I do not intend to limit myself to this particular application of the invention except as I may hereafter do so in the claims.

I will state at this point, however, that owing to the fact that the features of invention are particularly intended for use in the handling of coke oven doors and the like said features will be more easily understood and their use appreciated by reference to a construction of machine designed especially with this end in view.

The doors for coke ovens are relatively large and heavy, and they are generally lined with highly refractory material, such as silica brick or the like. It is quite customary to seat the coke oven doors in door jambs or openings into which they may be wedged to a certain extent, and, in addition to this fact, it is very common practice to lute the crack or joint around the edge of the door with clay of other sealing material. When this material dries and hardens while the door is in closed position it operates more or less in the nature of a cementing material. In order to remove the door, it is first necessary to break this cementing material, and for this reason it is generally necessary to apply a large force to the door at the commencement of the operation of withdrawing it from the oven.

Manifestly, in those cases in which the door is withdrawn by a straight pull a sufficient force must be exerted to break the seal around the entire periphery of the door at one time. After this result has been attained, the door may be withdrawn with comparative facility.

One of the objects of the present invention is to provide a construction of door machine such that the operation of breaking the seal, when a sealing material is used, will be performed in such manner as to shear the material along the line of shear, commencing at one end of the door and traveling toward the other, and as distinguished from an operation in which the entire seal is simultaneously broken. By the use of an arrangement in which the seal is thus broken with the shearing action, the amount of force necessary to be applied will be greatly reduced, thereby effecting a considerable saving in power as well as making it possible to design and build the machine in a lighter and cheaper manner.

Another feature of the invention relates to the provision of means, whereby, after the shearing action has been completed and the door thereby more or less completely released from its seat, it may be removed by a movement in which it will be bodily raised as well as being withdrawn, so as to increase the clearance of the lower portion of the door above the platform at the side of the oven or any obstruction at that point.

Another feature of the invention relates to the provision of means for insuring the breaking of the seal along the line of shear, which means is furthermore so constructed that, at the very time when the seal is being broken, previously stored up energy—as, for example, in a spring—will be released to assist the motor or other driving element for the purpose of breaking the seal.

Another feature of the invention is to provide an arrangement such that when the door machine is initially moved into position to engage the door a spring or other resilient element will be brought into play for the purpose of storing up a certain amount of energy, thereby taking up any shock which would otherwise be occasioned through the impact or engagement of the lifting elements with the door.

Other objects and uses of the invention will appear from a detailed description of the same, which consists in the details of construction and combination of parts hereinafter described and claimed.

Referring to the drawings,—

Figure 1 shows a side elevation of a door machine embodying the features of the present invention, the same having been moved

into position adjacent to, and engaged with, a door preparatory to withdrawing said door from its seat;

Fig. 2 is a view similar to Fig. 1, with the exception that the door carrier has been backed away on the carriage so as to fully withdraw the door, the initial position of the door being shown by dotted lines; and

Fig. 3 is a vertical section taken on the line 3—3 of Fig. 1, looking in the direction of the arrows.

I will first state that, as a matter of convenience, I have illustrated the present invention as applied to a bench of coke ovens in which there are vertical buck-stays 4 constituting a portion of the frame work. I have also illustrated a door jamb 5 within which seats the door 6.

Along the upper portion of the bench of ovens I have illustrated a series of brackets 7 and other framework 8 which carry the girders 9 and 10 on which are located the rails 11 and 12.

A carriage designated in its entirety by the numeral 13 travels on said rails, being provided for this purpose with wheels 14 and 15. Any suitable means may be provided for moving said carriage 13 back and forth on the rails so as to bring the same into position adjacent to any selected oven door.

Downwardly depending from the carriage is a suitable framework which includes the transversely extending beams 16 and 17. Manifestly these beams 16 and 17 are prevented from moving back and forth toward and from the oven structure by reason of the carriage from which they are suspended. In order, however, to prevent said carriage from lifting off the rails 11 and 12 owing to the side thrust occasioned in the operation of the machine, rollers such as 18 and 19 may be provided, said rollers bearing against the under surface of the girder 10.

Supported by the beams 16 and 17 is a door carrier designated in its entirety by the numeral 20. This door carrier is adapted to travel back and forth with respect to the beams 16 and 17, and during such travel withdraws or inserts the door as controlled by the operator.

In the lower front portion of the door carrier 20 is a downwardly depending box frame 21. A pair of door-engaging members 22 and 23 are provided in conjunction with this member 21, which door-engaging members 22 and 23 are adapted to take the load of the door and also to insure a proper movement of the door as the carrier 20 moves back and forth. In the particular construction illustrated these door-engaging members 22 and 23 are provided at their outer ends with lifting hooks 24 and 25, respectively, which lifting hooks when used are adapted to engage lifting hook sockets 26 and 27 on the outer face of the door. I wish it distinctly understood, however, that the use of lifting hooks and lifting hook sockets is purely optional and is only illustrated in the present case as a matter of convenience, since it will be evident that many other arrangements or constructions might be substituted therefor, any one of which would be satisfactory for the present purpose.

The door-engaging members 22 and 23 are connected together by an upright member 28. This upright member has a rack 29 which is engaged by a pinion 30, which pinion may be rotated by a hand-wheel 31. Manifestly this construction permits the door-engaging members to be raised a sufficient amount to take the load of the door in the first instance, or to disengage from the door after the door has been seated.

The door carrier 20 is supported by wheels 32 and 33 which travel upon rails 34 and 35 on the beams 16 and 17. In order to move the door carrier 20 back and forth on said rails, I have illustrated the rails as being provided with central racks 36 and 37, respectively, which racks are engaged by pinions 38 and 39 on the door carrier. As a matter of convenience in construction, these racks 36 and 37 are shown as being centrally positioned in the rails 34 and 35, the wheels 32 and 33 being centrally divided and the pinions 38 and 39 being formed in the central portions of said wheels.

A motor 40, mounted on the door carrier, drives a jack shaft 41^a, which is connected to the pinions 38 and 39, this drive being effected through the medium of a worm 41, worm gear 42 and idler pinions 43.

In the ordinary operation of the construction of machines so far described, the door would be withdrawn from or seated in its seat by a direct back-and-forth movement. I will now describe the means and construction whereby, in the movements of the door carrier, the seal may be broken along the line of shear, and, if desired, the door may be caused to rise bodily in its backward movement so as to secure a greater clearance over the platform.

For this purpose the trackways 36 and 37 are so formed that during the initial portion of the movement of backing the carrier 20 away from the oven the door-engaging elements 22 and 23 may descend at such a rate as to cause the door to pivot on its lower edge 44 until the carrier has moved backward such a distance as to establish a substantial angle between the door and the vertical position which it initially occupies. The amount of this angle so established will in each case depend upon the design of the machine, but in the particular construction illustrated it will be seen from ex-

amination of Fig. 2 that the door in its removed position has its upper end tilted backward a very substantial amount.

A convenient arrangement for bringing about this initial tilting or pivoting movement of the door on its lower edge 44 is to curve the inner ends of the trackways 34 and 35 so as to establish the arcuate portions 45 illustrated in Figs. 1 and 2, which arcuate portions are curved about the lower end of the edge 44 as a center or axis.

The aforementioned curvature of the trackways 34 and 35 is continued backward to a point 36ª. The point 36ª is so located that when the wheels 32 reach said point the door will have been rocked about its lower edge 44 through the desired angle. Ordinarily the rear portion of the trackways 34 and 35 will be made of form similar to the front portions thereof, so that the wheels 33 will travel in substantial parallelism to the wheels 32, thereby insuring that the door carrier 20 will at all times remain parallel to itself.

After the door carrier has traveled back to the point 36ª in the trackways 34 and 35, it may thereafter travel either in a straight line, in which case the door will be withdrawn without rising, or the rear portions of the track-ways 34 and 35 may be raised or elevated, as is clearly evident in Figs. 1 and 2. In this latter case the door carrier 20 will be bodily raised after the door has been initially tilted, and of course the amount of this rise will depend upon the construction of the machine.

Ordinarily the door carrier 22 will perform the major portion of the work or pull necessary to withdraw the door. The door carrier 23, in such case, may serve simply as a guide or, as in the present case, may be used to insure that the lower edge of the door will remain in position until the proper tilt has been given to the door. The latter type of construction is illustrated in the drawings. For this purpose the door carrier 23 is provided with a rearwardly extending plunger 46, working within a box-like structure 47, a spring 48 normally projecting the plunger 46 outward until its movement is arrested by the engagement of its flange 48ª with a stop 49 on the box-like structure 47. The tendency of this spring 48 will be to retain the plunger 46 projected outwardly at all times, and therefore, as the door carrier is backed away from the oven, the member 23 will press back against the lower portion of the door so as to keep its lower edge 44 in the initial position. When using this type of construction the maximum tilt which will be given to the door will depend upon the relative amount of movement of the plunger 46, as permitted by the engagement of the flange 48ª with the stop 49.

It is observed that when a machine embodying this construction is initially advanced into position to engage the door the carrying member 23 is fully projected by the spring 48, and will come into contact with the door prior to the engagement of the carrying member 22. It will then be necessary to compress the spring 48 a sufficient distance to permit the carrying member 22 to come into engagement with the door, and the energy thus stored up in the spring 48 will tend to again force the door carrier 20 backward on its tracks. This tendency will be available during the subsequent operation of actually breaking the seal, and will therefore assist the motor 40 in breaking the seal of the door.

Furthermore, the spring 48 will serve to take up a substantial portion of whatever shock may be caused at the instant of contact with the door. In order, however, to still further reduce such shock, and also to take up any excessive strains that may be generated, I have illustrated rollers 50 and 51 traveling against rails 52 on the under faces of the beams 16 and 17, the rollers 51 being mounted in box journals which are provided with springs 53, so that the door carrier 20 may, in case of necessity, rise slightly with respect to the beams 16 and 17.

While I have herein shown and described only a single embodiment of the features of my invention, still I do not limit myself to the said embodiment except as I may do so in the claims.

I claim:

1. The combination with a bench of coke ovens having a plurality of door openings in one side and a door for each opening, of a trackway extending along the upper portion of the bench adjacent to said openings, a carriage traveling on said trackway, means for propelling the carriage along the trackway, a pair of transversely extending tracks on the carriage, a downwardly depending door carrier suspended from said tracks, racks and pinions in conjunction with the carriage and door carrier for moving the door carrier back and forth on said tracks, a door supporting member rigidly secured to the door carrier, another door supporting member movably mounted in the door carrier at a point below the first mentioned door supporting member, a spring normally tending to project the last mentioned door supporting member to a position limited by a stop, and means for simultaneously raising and lowering both of the door supporting members, the tracks aforesaid having their inner end portions curved substantially on the arc of a circle drawn about the lower end of the door openings as a center, and the rear portions of said tracks extending upwardly, substantially as described.

2. The combination with a bench of coke

ovens having a plurality of door openings on one side and a door for each opening, of a trackway extending along the upper portion of the bench adjacent to said door openings, a carriage traveling on said trackway, means for propelling the carriage along the trackway, a pair of transversely extending tracks carried by the trackway, a door carrier mounted upon said tracks, means for moving the door carrier back and forth on said tracks, a door supporting member mounted on the door carrier, another door supporting member movably mounted on the door carrier beneath the first-mentined door supporting member, means normally tending to project the second mentioned door supporting member to a position limited by a stop, and means for simultaneously raising and lowering both of the door supporting members, the tracks aforesaid having their forward ends formed substantially on the arc of a circle drawn about the lower end of the doors as a center and the rear portions of the tracks extending upwardly, substantially as described.

3. The combination with a bench of coke ovens having a plurality of door openings on one side and a door for each opening, of a carriage adapted to travel back and forth adjacent to the bench of ovens into position adjacent to a selected door opening, transversely extending tracks on said carriage, a door carrier mounted to travel back and forth on said tracks, means for effecting such travel under the control of the operator, a door supporting member fixedly mounted on the door carrier, another door supporting member movably mounted on the door carrier beneath the first mentioned door supporting member, means normally tending to project the second mentioned door supporting member to a position limited by a stop, and means for simultaneously raising and lowering both of the door supporting members, the tracks aforesaid being formed on the arc of a circle drawn about the lower end of the doors as a center, the outer end of said arc terminating at the position of a line drawn from the lower end of the door opening upwardly through both of the door supporting members when the second mentioned door supporting member is fully projected and the rear portions of the tracks extending upwardly from said point, substantially as described.

4. The combination with a bench of coke ovens having a plurality of door openings on one side and a door for each opening, of a carriage adapted to travel back and forth adjacent to the bench of ovens into position adjacent to a selected door opening, transversely extending tracks on said carriage, a door carrier mounted to travel back and forth on said tracks, means for effecting such travel under the control of the operator, a door supporting member fixedly mounted on the door carrier, another door supporting member movably mounted on the door carrier beneath the first mentioned door supporting member, means normally tending to project the second mentioned door supporting member to a position limited by a stop, and means for simultaneously raising and lowering both of the door supporting members, the tracks aforesaid being formed on the arc of a circle drawn about the lower end of the doors as a center, the outer end of said arc terminating at the position of a line drawn from the lower end of the door opening upwardly through both of the door supporting members when the second mentioned door supporting member is fully projected, substantially as described.

5. The combination with a bench of coke ovens having a plurality of door openings on one side and a door for each opening, of a carriage adapted to travel back and forth adjacent to the bench of ovens into position adjacent to a selected door opening, transversely extending tracks on said carriage, a door carrier adapted to move back and forth on said tracks, a door supporting member fixedly mounted on the door carrier, another door supporting member movably mounted on the carriage at a position beneath the first mentioned door supporting member and means for projecting the second mentioned door supporting member to a position limited by a stop, the front portion of the tracks being formed on the arc of a circle drawn about the lower end of the doors as a center to a point coincident with the line drawn through the lower end of the door opening and both of the door supporting members when the second mentioned door supporting member is fully projected, substantially as described.

6. The combination with a bench of coke ovens having a plurality of door openings on one side and a door for each opening, of a carriage adapted to travel back and forth in front of the door openings, transversely extending tracks on said carriage, a door carrier mounted on said tracks and a pair of door supporting members on said door carrier, one of said door supporting members being fixed and the other being movable to a position limited by a stop, the front portions of the tracks aforesaid being formed on the arc of a circle drawn about the lower end of the doors as a center to a point coincident with a line drawn through the lower end of the door opening and both of the door supporting members when the movable door supporting member is fully moved, substantially as described.

7. The combination with a bench of coke ovens having a plurality of door openings on one side and a door for each opening, of a carriage adapted to travel back and forth

adjacent to said openings, a door carrier transversely movable on said carriage, guides for said door carrier in its movement aforesaid, and a pair of door supporting members on the door carrier, one of said door supporting members being fixed and the other movable to a position limited by a stop, the guides aforesaid having their front portions curved on the arc of a circle drawn about the lower end of the door opening as a center to a point coincident with the line drawn through the lower end of the door opening and both of the door supporting members when the movable door supporting member is fully moved, substantially as described.

8. The combination with a bench of coke ovens having a plurality of door openings on one side and a door for each opening, of a carriage adapted to travel along the bench adjacent to said openings, a transversely movable door carrier in said carriage, guides for said door carrier in its movements aforesaid, and a pair of door supporting members in said door carrier, one of said door supporting members being fixed and the other being movable to a position limited by a stop, the front portions of the guides aforesaid extending downwardly to a position coincident with the line drawn through the lower end of the door opening and both of the door supporting members when the movable door supporting member is fully moved, substantially as described.

9. The combination with a bench of coke ovens having a plurality of door openings on one side and a door for each opening, of a carriage adapted to travel adjacent to the openings aforesaid, a door carrier transversely movable in said carriage, guides for said door carrier in its movements aforesaid, and a pair of door supporting members in the door carrier, one of said door supporting members being fixed and the other being movable to a position limited by a stop, the front portions of the guides aforesaid extending downwardly, substantially as described.

10. The combination with a bench of coke ovens having a plurality of door openings on one side and a door for each opening, of a carriage adapted to travel along the bench of ovens adjacent to said openings, a door supporting member movably mounted within the carriage and adapted to move transversely thereof, guides for said door carrier in its movements aforesaid, and a pair of door supporting members in the carrier, one of which is fixed and the other of which is movable to a position limited by a stop, under spring pressure, substantially as described.

JOHN KRIPPNER.