

May 20, 1930.

J. McINTOSH

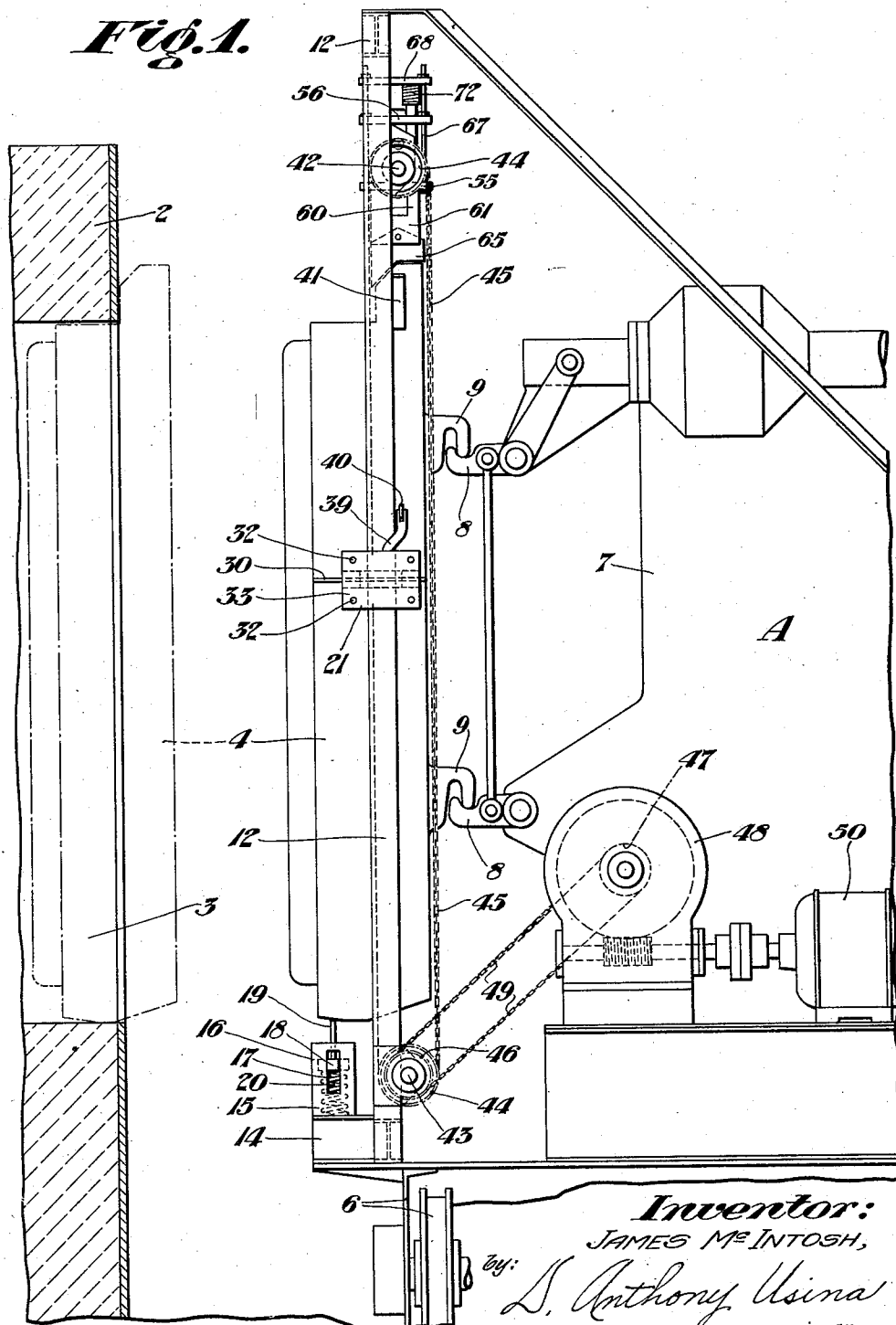
1,759,014

DOOR CLEANING APPARATUS

Filed June 15, 1928

4 Sheets-Sheet 1

Fig. 1.



Inventor:

JAMES McINTOSH,

by:

L. Anthony Usina

his Attorney.

May 20, 1930.

J. McINTOSH

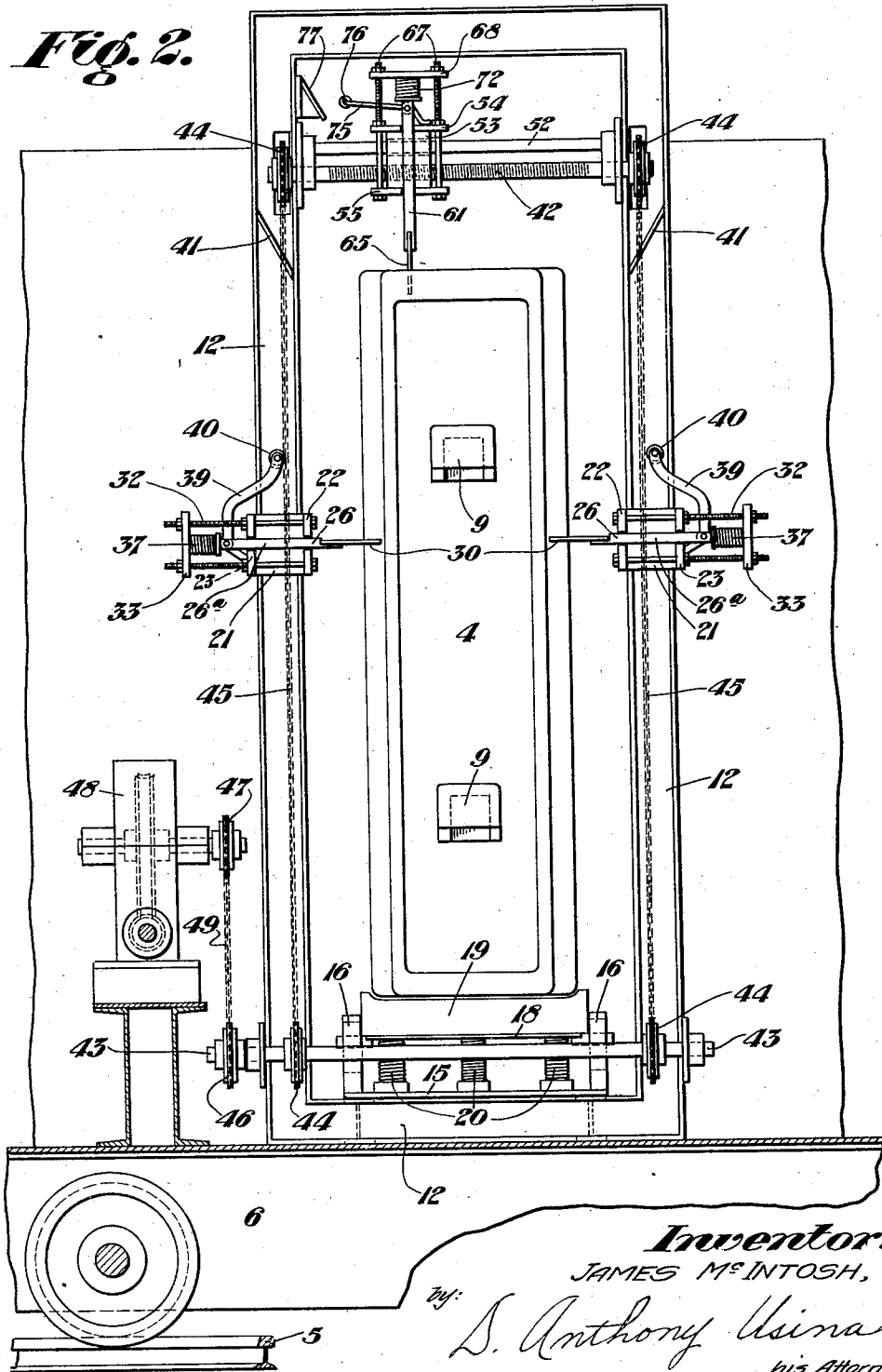
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4 Sheets-Sheet 2

Fig. 2.



Inventor:
JAMES McINTOSH,

By:

D. Anthony Usina

his Attorney.

May 20, 1930.

J. McINTOSH

1,759,014

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4 Sheets-Sheet 3

Fig. 3.

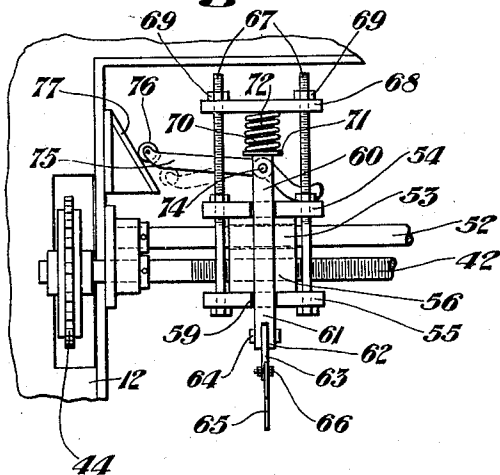


Fig. 4.

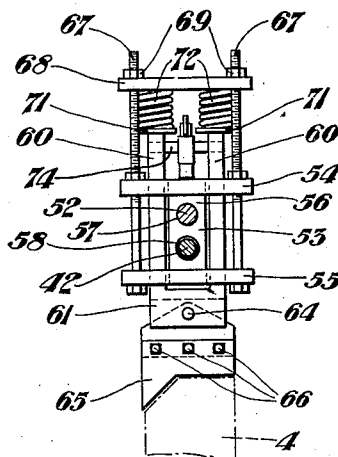


Fig. 5.

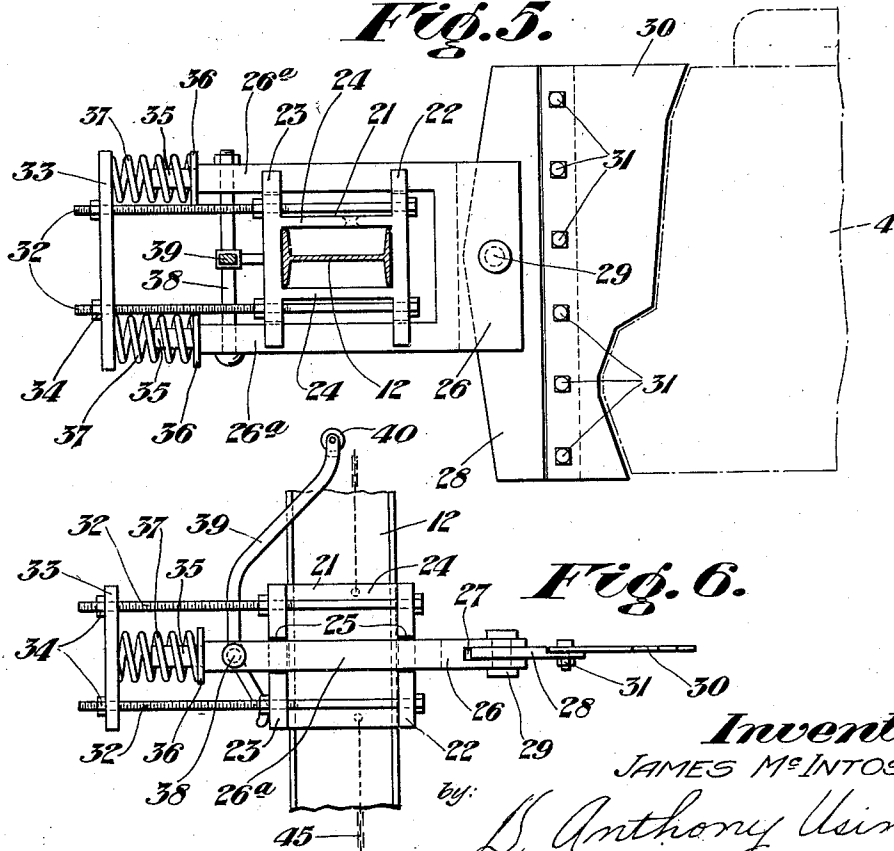


Fig. 6.

Inventor:

JAMES McINTOSH,

by: *L. Anthony Usina*
his Attorney.

May 20, 1930.

J. McINTOSH

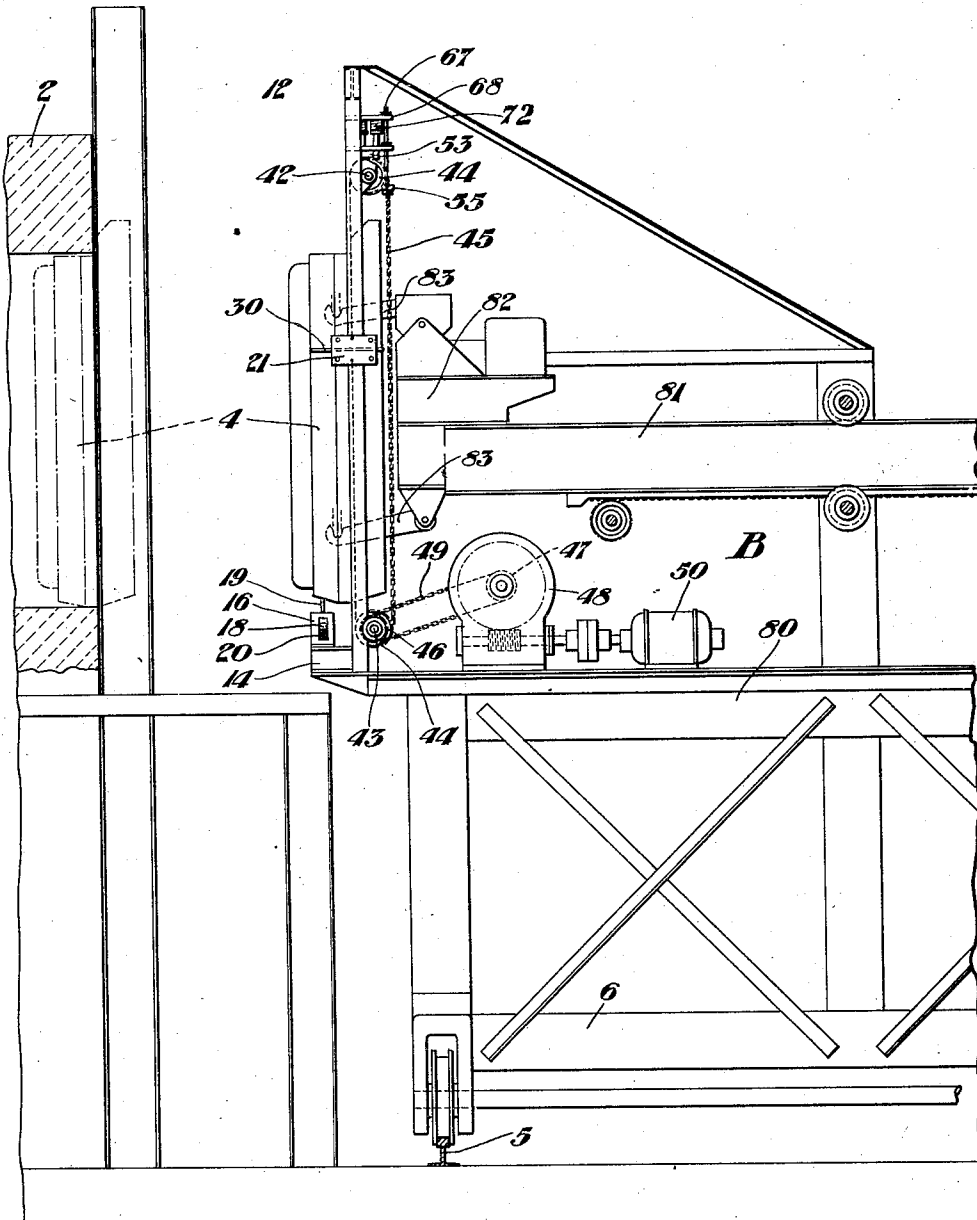
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4 Sheets-Sheet 4

Fig. 7.



Inventor:

JAMES McINTOSH,

by *L. Anthony Usina*
his Attorney.

UNITED STATES PATENT OFFICE

JAMES MCINTOSH, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO THE KOPPERS COMPANY, A CORPORATION OF DELAWARE

DOOR-CLEANING APPARATUS

Application filed June 15, 1928. Serial No. 285,756.

This invention relates to door cleaning apparatus and, while not limited thereto, relates more particularly to apparatus for cleaning the sealing material and other foreign matter from the edges of the doors of by-product coke ovens and the like.

By-product coke ovens generally consist of a plurality of horizontal ovens arranged side-by-side in groups called batteries. The ovens or coking chambers vary in size for the different plants. One of the plants to which this invention has been applied has ovens of approximately 42 feet in length, 14 feet in height, and the width varies from 15½ inches at the pusher end to 17½ inches at the coke end. These dimensions, which vary at different plants, serve to indicate the general shape of the chambers in which coal is carbonized. Each oven is provided with a plurality of top openings or charging holes, having removable lids through which the coal to be coked is charged, and also is provided with a doorway surrounded by a cast iron door-frame and closed by a removable cast iron, brick-lined door at each end, one doorway being for the purpose of permitting the discharge of the coke, and the other doorway being for permitting the entrance of a pushing ram to push out the coke.

The doors at each end of the coking chambers are adapted to be sealed in position with a mixture of clay and coke dust to prevent the escape of gases and vapors during the coking process. During the coking process some leakage of gas and vapors may occur through the seal, and the tar vapors condense and form a pastry mixture with the clay and coke dust, which mixture, when exposed to the heat of the ovens, becomes very hard and adheres tenaciously to the oven doors and door-frames. Unless the above described deposits are removed from the doors and door-frames each time the doors are removed from the oven, it soon builds up sufficiently to cause considerable difficulty in remounting the doors and prevents the forming of a tight seal.

Prior to this invention the above deposits were removed by hand tools and the removal required considerable hard labor under very

difficult conditions, and at best the doors were generally only partly cleaned, due partly to the character of labor that is available for this class of work, and also due to the short time in which the doors remain off the oven.

The present invention provides a mechanical apparatus, which is mounted on the door operating machine on the coke side and on the pusher machine on the pusher side of the ovens, that will mechanically clean all the edges of the door. This apparatus is operated by the machine operators and, therefore, requires no other labor. Furthermore, the apparatus will completely clean the doors in less time than it takes to discharge the coke from the ovens, so that the doors will all be completely cleaned before they are replaced.

In the drawings:

Figure 1 is a partial side elevation of a coke oven door machine having the door cleaning mechanism of this invention applied thereto.

Figure 2 is a vertical sectional elevation through the door machine at the rear of the door cleaning mechanism.

Figure 3 is an enlarged fragmentary detail front elevation of the top scraper.

Figure 4 is an enlarged fragmentary detail end elevation of the top scraper.

Figure 5 is an enlarged plan view of the side scraper.

Figure 6 is an enlarged front side elevation of the side scraper.

Figure 7 is a partial side elevation of a coke pusher machine having the door cleaning mechanism of this invention applied thereto.

Referring more particularly to the drawings, the numeral 2 designates the coke ovens which are provided with the usual doorways 3 and doors 4 at each end. Tracks 5 are provided paralleling each side of the battery of ovens on which the door machine A and pusher machine B are adapted to travel. The door machine A is adapted to travel along the discharge or coke side of the ovens and the pusher machine is adapted to travel along the pusher side of the ovens.

The door machine A is of the standard "Koppers" type including a wheeled car-

riage 6 on which is mounted the usual door-operating mechanism 7, including a pair of vertically spaced door hooks 8 adapted to be extended and engaged with hook plates 9 on the doors 4, and to then be retracted to remove the doors 4 and carry said doors onto the door machine.

The doors 4 are adapted to be sealed in closed position by a mixture of clay and coke dust and this sealing material must be removed from the edges of the doors when they are removed in order to provide a clean surface so that the doors can be again seated and sealed in the doorways.

In order to provide for mechanically cleaning the doors on the coke side of the ovens, this invention provides a substantially rectangular frame 12 which is mounted on the door machine in position to receive and surround the doors as they are moved onto the machine by the door operating mechanism 7.

The frame 12 is formed from I-beam sections and is of greater dimensions than the doors to be cleaned so as to permit the travel of scraper members along each side and top of the doors.

A pair of short beam sections 14 are secured to the bottom end member of the frame 12 and project forwardly therefrom forming supporting brackets on which a U-shaped scraper guide-block 15 is rigidly secured. The block 15 has its upturned ends 16 slotted, as at 17, to receive the ends of an upstanding scraper blade-carrier 18 having a scraper blade 19 secured thereon. The scraper blade-carrier 18 is seated on a plurality of coiled springs 20 which form a yieldable support and yieldably urge said carrier and scraper blade upwardly so as to scrape the bottom edges of the door to be cleaned.

A scraper mechanism is slidably mounted on each of the side members of the frame 12, and said mechanisms each comprise a guide-block 21 slidably mounted on the frame side member and are composed of inner and outer flange-members 22 and 23, respectively, which are joined by a pair of spaced web-members 24 and extend along the opposite sides of the frame side member. The flanges 22 and 23 of the guide-block are slotted to form guideways 25 for the legs 26^a of a yoke-member 26 which is slidably mounted on the block with its closed end within the frame 12. The inner or closed end of the yoke 26 is slotted, as at 27, to receive a scraper blade-carrier plate 28 which is pivotally secured in position by a pin 29. A scraper blade 30 is secured to the free edge of the plate 28 by bolts 31.

A plurality of bolt-rods 32 are secured in the flanges 22 and 23 of the block 21 and extend outwardly materially beyond the outer flange 23. A bearing-plate 33 is mounted on the rods 32 adjacent their outer ends and is held in position by nuts 34. The outer ends

of the legs 26^a of the yoke 26 are reduced in diameter to form guide portions 35, and said legs terminate short of the plate 33. Bearing-washers 36 are mounted on each of the reduced portions 35 of the yoke legs 26^a to form seats for coil springs 37, which are mounted on the reduced portions 35, and are compressed between the bearing-washers 36 and the plate 33, so as to yieldably force said yoke 26 and scraper blade inwardly relative to the frame.

A shaft 38 is journaled in suitable bearings in the legs 26^a of the yoke 26 and a crank-lever 39 is secured on the shaft 38 and is adapted to have one end bear against the outer flange 23 of the block 21, while its upper end is provided with an anti-friction roller 40 adapted to engage an inclined bracket or cam trip member 41 secured to the side member of the frame adjacent the upper end thereof. The upper end of the lever 39 is adapted to engage the trip member 41 and to be rocked so as to force its lower end against the outer flange 23 of the block 21 and thus cause an outward pull on the shaft 38 and yoke 26 which will retract the yoke outwardly against the springs 37 so as to disengage the scraper blades from the door being scraped.

The scraper mechanisms on both side members are adapted to be simultaneously moved up and down on the side members of the frame 12. Shafts 42 and 43 extend transversely of the frame 12 adjacent its upper and lower ends, respectively, and are journaled in suitable bearings in the side members of the frame. The shafts 42 and 43 are provided with sprockets 44 at each end and chains 45 are trained over the sprockets 44 on the respective ends of the shafts 42 and 43 and have their ends secured to the blocks 21 of the respective scraper mechanisms.

The lower shaft 43 extends materially beyond the frame 12 at one end and has a second sprocket 46 secured thereon which is connected to the drive-sprocket 47 of a standard speed reducer 48 by a chain 49. A motor 50 is coupled to the speed reducer 48 and furnishes power for driving the scrapers.

The upper shaft 42 is threaded over the portion of its length between the sides of the frame 12 to form a drive for a top scraper mechanism to be described.

A guide-rod 52 extends transversely of the frame 12 parallel with the shaft 42 and spaced a short distance therefrom. A guide-block 53, composed of flanges 54 and 55 and a body member 56, is supported on the rod 52 and shaft 42. The body member 56, of the block 53, is provided with a plain aperture 57 through which the rod 52 is passed, and with a threaded aperture 58 in which the shaft 42 is threaded. As the shaft 42 is revolved to operate the side scraper mechanisms, the block 53 will be compelled to travel transversely

of the frame due to the threaded connection with the shaft 42.

The flanges 54 and 55, of the guide-block 53, are slotted to form guideways 59 for the legs 60 of a vertically disposed yoke-member 61 which is slidably mounted on the block with its closed end opposite the lower side of the block. The closed end of the yoke 61 is slotted, as at 62, to receive a scraper blade-carrier plate 63 which is pivotally secured in position by a pin 64. The scraper blade 65 is secured to the free edge of the plate 63 by bolts 66.

A plurality of bolt-rods 67 are secured in the flanges of the block 53 and extend upwardly a material distance beyond the upper flange 54. A bearing-plate 68 is mounted on the rods 67 adjacent their upper ends and is held in position by nuts 69. The upper ends of the legs 60 of the yoke-member 61 are reduced in diameter to form guide portions 70 and said legs terminate short of the plate 68. Bearing-washers 71 are mounted on each of the reduced or guide portions 70, of the yoke legs 60, to form seats for coil springs 72 which are mounted on the reduced or guide portions 70, and are compressed between the bearing-washers 71 and plate 68 so as to yieldably force the yoke 61 and scraper blade downwardly relative to the block 61.

A shaft 74 is journaled in suitable bearings in the legs 60 of the yoke 61 and a crank-lever 75 is secured on the shaft 74 and is adapted to have one end bear against the upper flange 54 of the block 53, while its other end is provided with an anti-friction roller 76 adapted to engage an inclined bracket or cam trip member 77 secured to the inner face of one of the side members of the frame 12. The lever 75 is adapted to engage the trip member 77 and to be rocked so as to force its lower end against the upper flange 54 of the block 53, and thus cause an upward pull on the shaft 74 and yoke 61 which will retract or raise the yoke 61 against the springs 72 so as to disengage the scraper blade 65 from the upper edge of the door being cleaned.

In operation, when the coke is to be removed or discharged from one of the ovens 2, the door machine A will be spotted in front of the oven from which the coke is to be discharged, and the usual door operating or handling mechanism will be operated to remove the door 4 from the coke side of the oven and move or convey said door onto the door machine. As the door is moved onto the door machine A, by the usual door operating mechanism 7, it will be moved into the frame 12, and as the door is moved into the frame 12, the lower edge of the door will engage the lower scraper blade 19 and any foreign matter on the lower edge of the door will be scraped off. After the door is positioned stationary within the frame 12, the motor 50 will be

energized to cause the shafts 42 and 43 and chains 45 to operate to feed the side and top scraper mechanisms along the side and top edges, respectively, of the door 4. The side scraper mechanisms will move down along the door, while the top scraper mechanism will move from left to right across the upper edge of the door. After the scraper mechanisms have traveled the entire length and width, respectively, of the door, the motor 50 will be reversed to return the scraper mechanisms to their starting positions. As the side and top scraper mechanisms approach their starting positions, the levers 39 of the side scrapers and the lever 75 of the top scraper will engage the tripping brackets or cams 41 and 77, respectively, so as to cause said levers to retract the scraper mechanism and release the door.

The scraping or cleaning of all four side edges of the door by the mechanism above described is quickly done, and all foreign matter and sealing material is removed in much less time than was possible to imperfectly clean the doors by the hand operations heretofore practiced.

Furthermore, no labor is necessary for cleaning the doors since the mechanical scraping mechanism of this invention is under the control of the door machine operator.

In Figure 7 I have shown a pusher machine having my door scraping or cleaning mechanism applied thereto. The door scraping or cleaning mechanism is an exact duplicate of the mechanism applied to the door operating machine for the coke side of the ovens, and the same reference numerals are applied thereto.

The pusher machine is of the standard "Koppers" type and comprises the usual wheeled carriage 80 having a pushing ram (not shown) and door handling or extracting ram 81 with extracting ram head 82.

The door handling ram 81 is provided with the usual door hooks 83 adapted to engage the hook plates on the doors 4 of the oven.

The operation of this pusher machine B, as relating to the cleaning of the doors 4, is substantially the same as that of the door machine A.

The machine is spotted in front of the oven to be pushed and from which the door on the coke side has been removed by the door machine A. The door handling ram 81 is then operated to remove the door 4 on the pusher side of the oven and move said door into the frame 12. The pusher machine will then be advanced along its track sufficiently to bring the pusher ram in line with the doorway from which the door has been removed.

The pusher ram is then advanced to push the coke out of the oven and, while the pushing operation is in progress, the scraper

mechanisms will be operated to clean the door 4 ready for replacement at the completion of the pushing operation.

While I have shown and described certain specific embodiments of my invention, it will be understood that I do not wish to be limited thereto since various modifications may be made without departing from the scope thereof, as defined in the appended claims.

I claim—

1. In a door cleaning mechanism a frame having an outline substantially the same as the outline of the door to be cleaned, scraper members mounted on and movable relative to the side members of said frame, at least one other scraper member carried by and movable transversely of said frame, and means for moving said scrapers relative to said frame.

2. In a door cleaning mechanism a frame having an outline substantially the same as the outline of the door to be cleaned, scraper members mounted on and movable along the side members of said frame, at least one other scraper member carried by and movable transversely relative to said frame, and means for simultaneously moving all of said scrapers.

3. In a door cleaning mechanism a substantially rectangular frame, scraper members mounted on and adapted to travel longitudinally relative to the side members of said frame, at least one other scraper carried by and adapted to travel transversely of said frame adjacent one end thereof, each of said scraper members being provided with a scraping blade yieldingly mounted for movement in a direction at right angles to the line of travel of the respective scraper members, and means for propelling all of said scrapers.

4. In a door cleaning mechanism a substantially rectangular frame, scraper members mounted on and movable longitudinally relative to the side members of said frame, shafts extending transversely of and journaled in said frame adjacent each end thereof, sprockets on said shafts adjacent each end thereof, chains trained over the sprockets and having their ends secured to said scrapers whereby rotation of said shafts will cause said chains to travel longitudinally of said frame and thereby move said scrapers longitudinally of said frame, and means for rotating said shafts.

5. In a door cleaning mechanism a substantially rectangular frame, scraper members mounted on and movable longitudinally relative to the side members of said frame, shafts extending transversely of and journaled in said frame adjacent each end thereof, sprockets on said shafts adjacent each end thereof, chains trained over the sprockets and having their ends secured to said scrapers whereby rotation of said shafts will cause said chains to travel longitudinally of said

frame and thereby move said scrapers longitudinally of said frame, at least one of said shafts being screw-threaded over at least a portion of its length, a guide-rod extending transversely of said frame in close proximity to and parallel with said threaded shaft, a scraper member slidably mounted on said guide-rod and movable longitudinally thereof, a nut carried by said scraper and having a threaded engagement with said threaded shaft whereby when said shaft is rotated said scraper will be compelled to travel longitudinally of said guide-rod, and power means for rotating said shafts.

6. In a door cleaning mechanism a supporting frame, scraper mechanisms mounted on said frame and movable relative thereto, each of said mechanisms comprising a guide-block member mounted on said frame, a scraper blade-carrier mounted on said block and movable relative thereto, a scraper blade secured to said carrier, means for yieldably urging said blade-carrier and blade inwardly relative to said frame, means for propelling said block relative to said frame, and means for automatically retracting said blade-carrier and blade against the force of said yieldable means at one point at least in the travel of said block relative to said frame.

7. In a door-cleaning mechanism, a carriage, means for supporting a door to be cleaned on said carriage, scraper members movable along the sides of the door while it is supported on said carriage, at least one other scraper member movable along one of the ends of said door while said door is supported on said carriage, and means for simultaneously moving all of said scraper members.

In testimony whereof, I have hereunto set my hand.

JAMES McINTOSH.