B. WATANABE.

COKE RAKE.

APPLICATION FILED MAY 5, 1919.

1,349,176.

Patented Aug. 10, 1920.

7 SHEETS—SHEET 1.

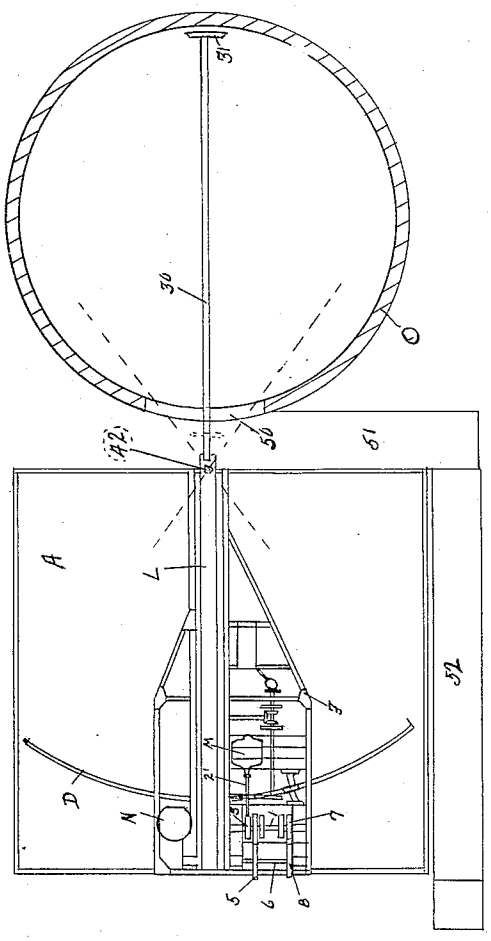


Fig. 1.

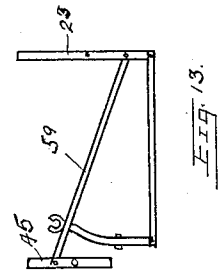


Fig. 13.

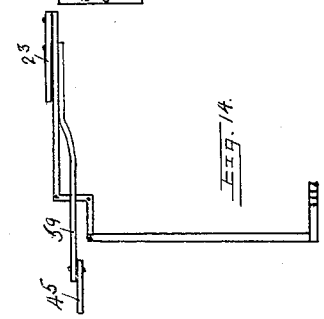


Fig. 14.

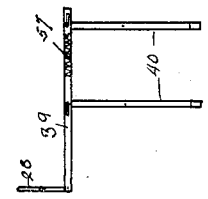


Fig. 15.

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7 SHEETS—SHEET 2.

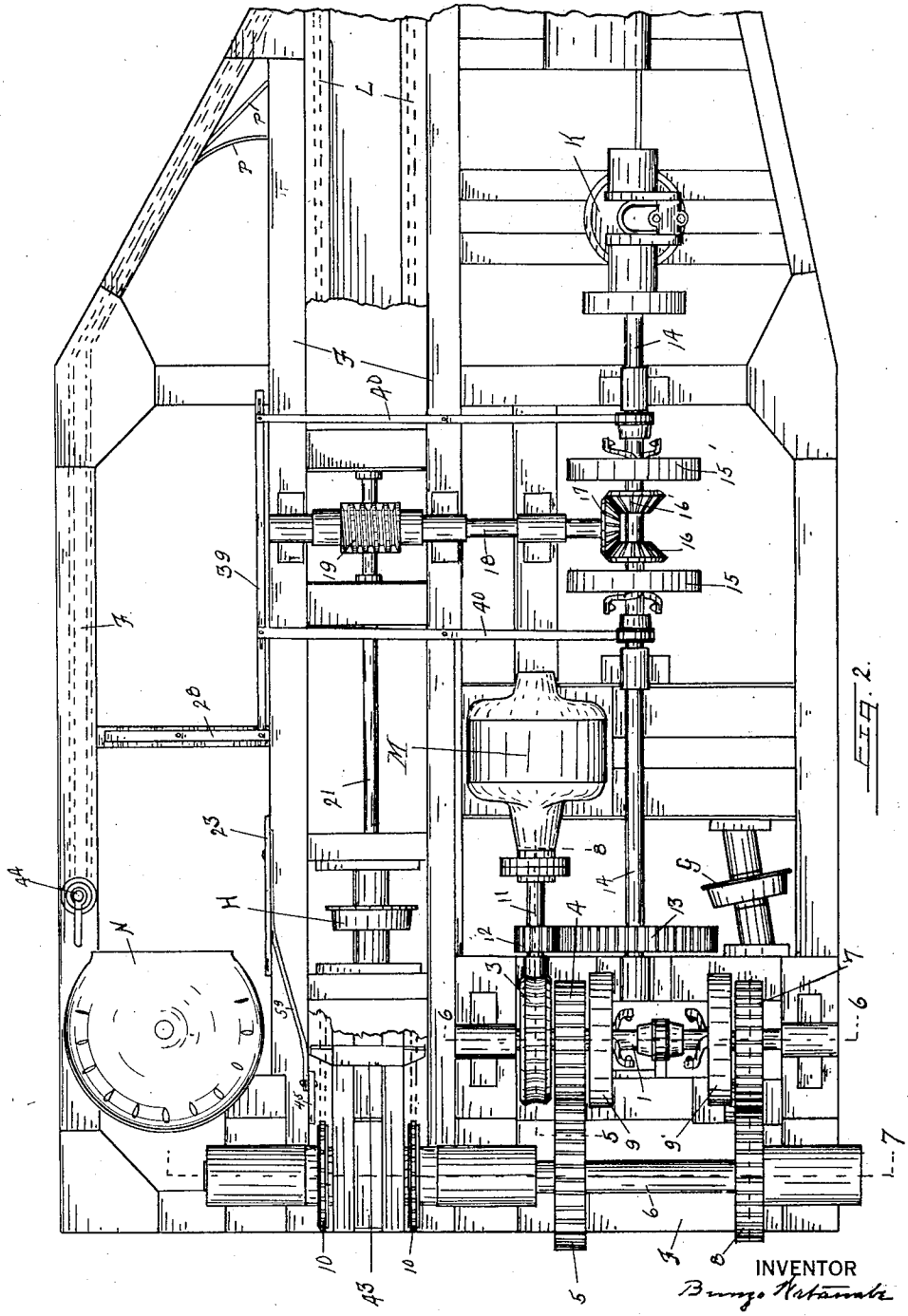


FIG. 2.

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7 SHEETS—SHEET 3.

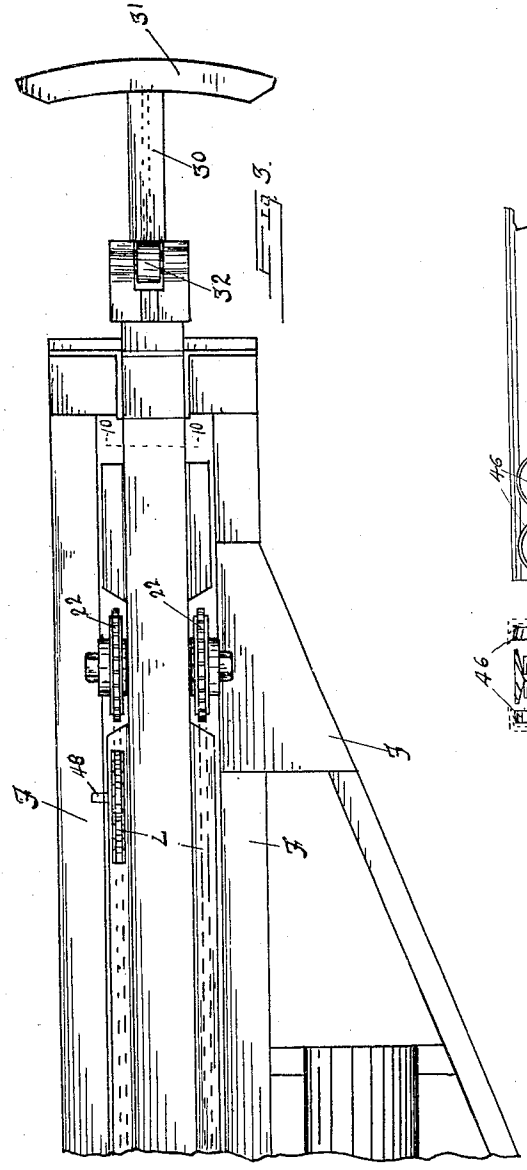


Fig 9.

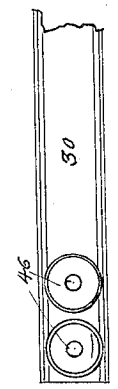
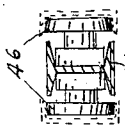


Fig 11



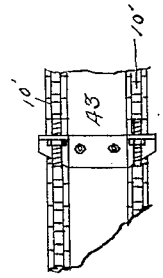


Fig 12.

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7 SHEETS—SHEET 4.

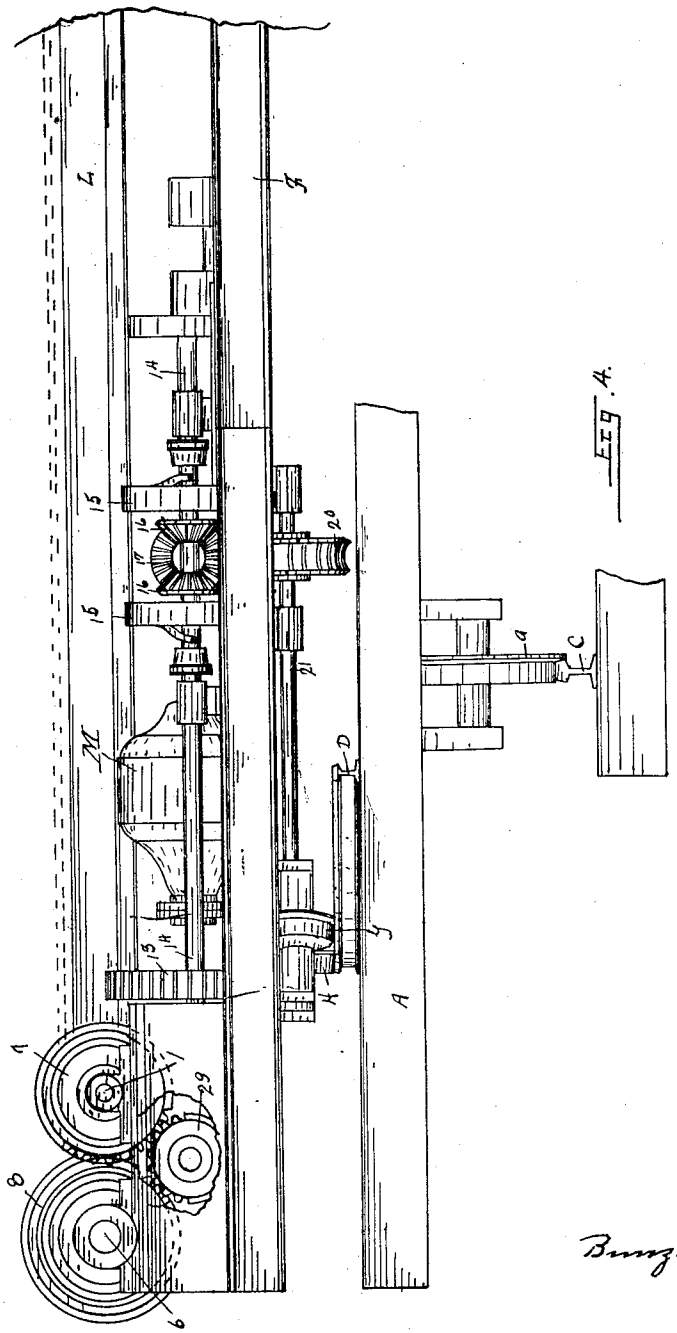


Fig. 4.

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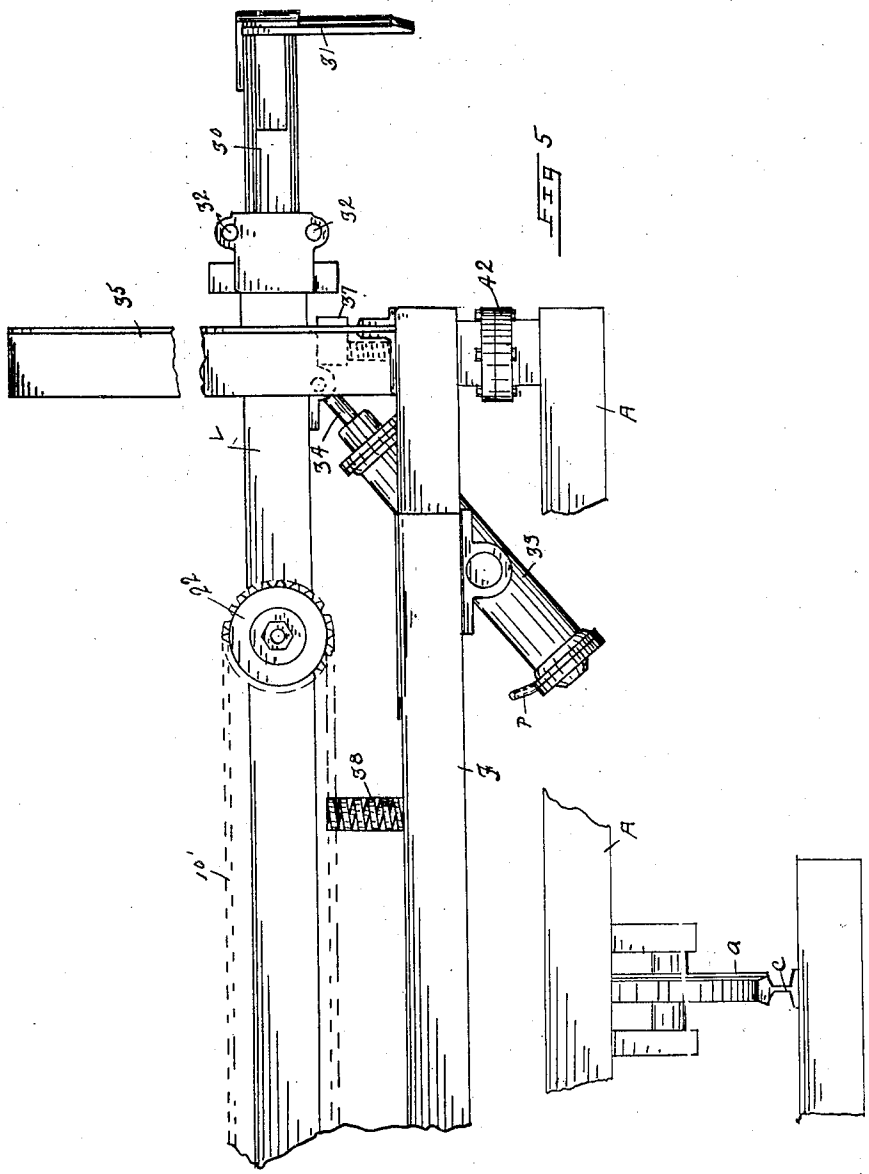
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7 SHEETS—SHEET 5.

FIG 5



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7 SHEETS—SHEET 6.

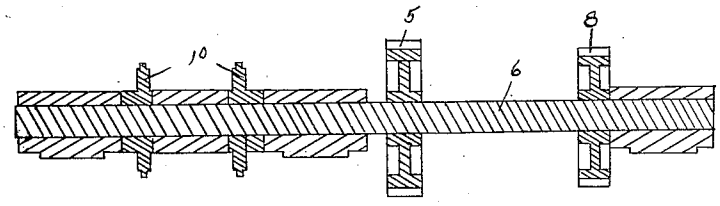


Fig 7

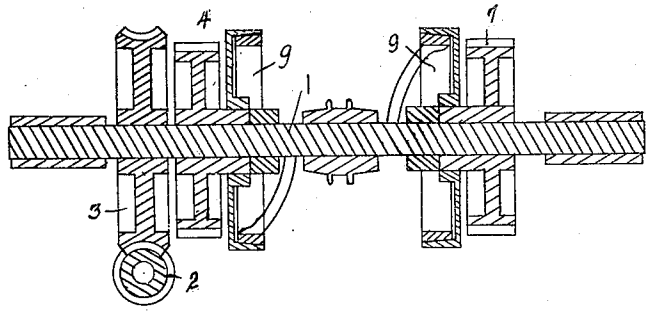


Fig 6

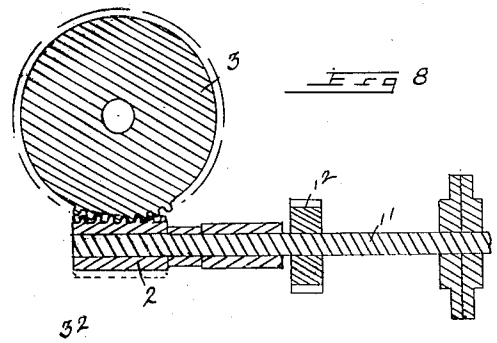


Fig 8

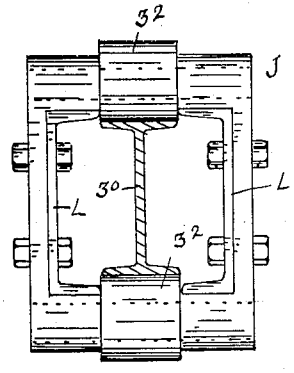


Fig 9

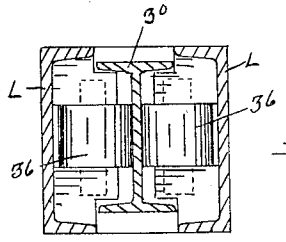


Fig 10

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7 SHEETS—SHEET 7.

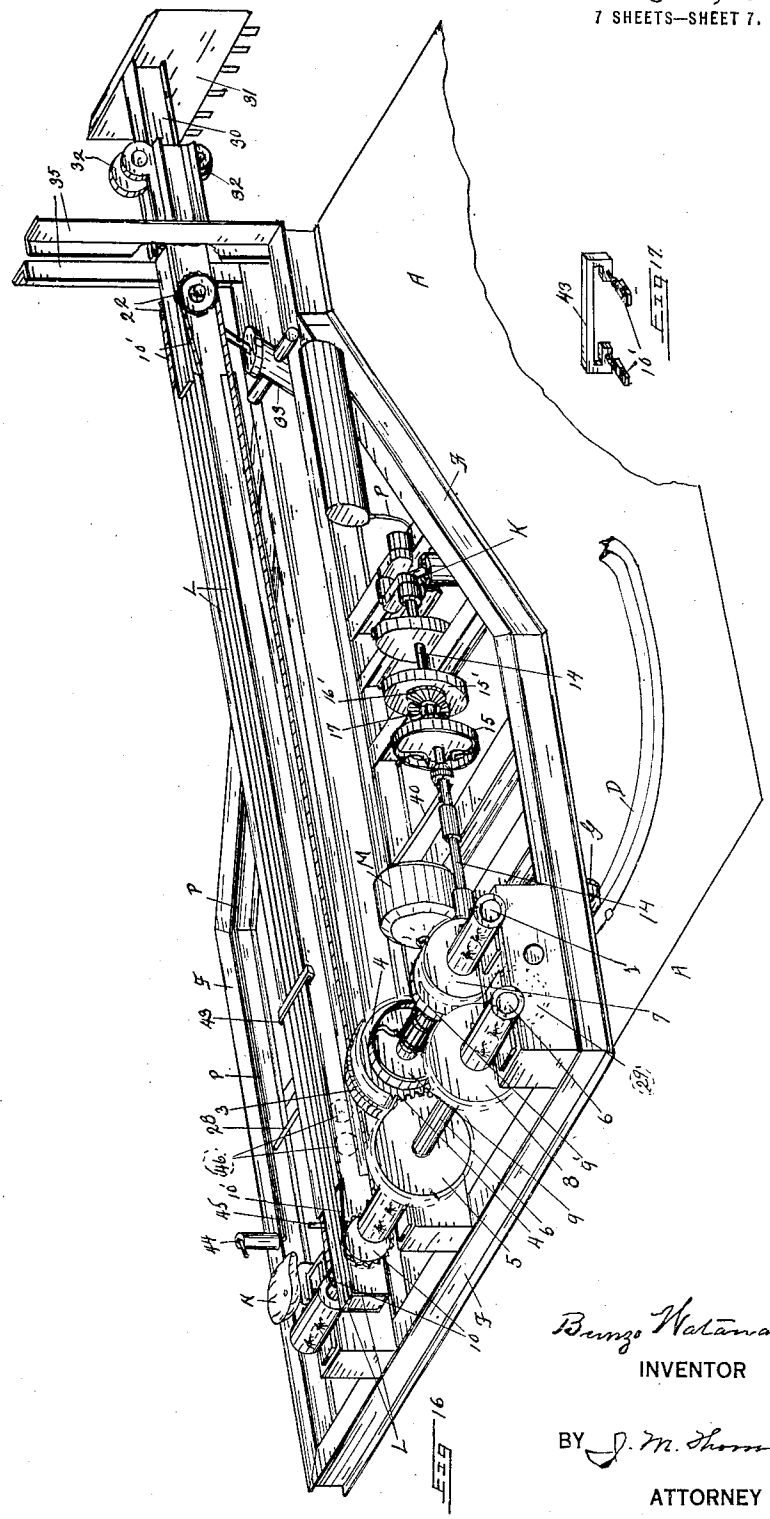


FIG. 16.

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INVENTOR

BY J. M. Thomas

ATTORNEY

UNITED STATES PATENT OFFICE.

BUNZO WATANABE, OF SALT LAKE CITY, UTAH, ASSIGNOR OF ONE-TENTH TO HENRY D. MOYLE AND PAUL H. RAY, OF SALT LAKE CITY, UTAH.

COKE-RAKE.

1,349,176. Specification of Letters Patent. Patented Aug. 10, 1920.

Application filed May 5, 1919. Serial No. 295,020.

To all whom it may concern:

Be it known that I, BUNZO WATANABE, a citizen of Japan, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Coke-Rakes, of which the following is a specification.

My invention relates to means for handling coke, and has for its object to provide a mechanical means for quickly and more economically drawing coke from any one of a string of ovens in which coke is burned, and loading it into a car or other conveyance before the coke or oven is cold or even while quite hot. A further object is to provide an apparatus which is strong and serviceable, and which is constructed and arranged to remove all of the coke from an oven of any shape or form.

These objects I accomplish with the apparatus illustrated in the accompanying drawings in which similar letters and numerals of reference indicate like parts throughout the several figures and described in the specification forming a part of this application and pointed out in the appended claims.

In the drawings in which I have shown a substantial embodiment of my invention Figure 1 is a plan view of the apparatus in position before a coke oven with no attempt made to show details of construction or operation. Figs. 2 and 3 are companion views showing a plan view of the complete apparatus, parts cut away. Figs. 4 and 5 are companion views showing the complete apparatus in elevation, parts cut away. Fig. 6 is a longitudinal section of the main shaft on line 6—6 of Fig. 2. Fig. 7 is a longitudinal section of the counter shaft and connections on line 7—7 of Fig. 2. Fig. 8 is a longitudinal section of an extension of the motor shaft on line 8—8 of Fig. 2. Fig. 9 is an end elevation of the handle casing, with the handle therein shown in section. Fig. 10 is a section on line 10—10 of Fig. 3. Fig. 11 a side elevation of the rollers on the rear end of the rake handle. Fig. 11ª is a cross section of the rake handle, and the rollers supporting the rear end of said handle. Fig. 12 is a plan view, somewhat enlarged from the other views, of a portion of the chains and cross bar. Figs. 13 and 14 are diagrammatic views of the hand lever, and connections. Fig. 15 is a diagrammatic view of the foot lever and connections. Fig. 16 is a view in perspective of parts of the machine, parts cut away and other parts shown in dotted lines. Fig. 17 is a view in perspective of the cross bar secured on the sprocket chains, and is the means to shift the operating lever to automatically move the rake toward or from the oven.

In removing coke from the oven in which it is burned it is highly desirable that the coke be removed as soon as it is cool enough that it will not fire the conveyance in which it is carried. Most of the coke is removed from the oven by manual labor, and the present invention is to expedite the handling of coke by removing it with mechanical means and before the oven or coke is cooled, and stating it broadly it consists of a platform provided with wheels to run on ordinary car tracks; a frame operable on said platform and pivoted thereto to pivotally revolve as a turn-table in front of an oven, with mechanism for operating the table and the rake and which mechanism is carried on the frame and moves said rake into or out of the coke oven together with a chute and elevator to carry the coke into a car after it is removed from the oven. In detail the present invention consists of a platform A mounted upon wheels *a—a* and adapted to be run over any ordinary railway rails *c*, which are secured on a road bed before or in front of the coke ovens. The track and platform A enable me to move my apparatus from oven to oven as the work progresses. A curved track D is placed on the platform A, and a frame F is operated on said track D by means of the wheels G and H which are journaled on the under side of the frame F. The said frame F is constructed of channel and angle irons well stayed and made rigid, and the mechanism of my apparatus is largely carried on said frame. A motor M, shown as electric, is mounted on said frame F and furnishes the power to operate all of my apparatus. The said motor M is connected with and rotates the main shaft 1 by means of the worm pinion 2 and worm gear 3 and parts connected therewith. The connection is such as to reduce the speed of the shaft 1 in relation to the motor. A pinion gear 4 is secured on and rotates with said shaft 1 the teeth of which mesh with the teeth of a gear wheel 5 that in turn is secured on a counter

shaft 6 suitably mounted on said frame F. Another pinion gear 7 is secured on said main shaft 1 the teeth of which engage with the teeth of an idler gear 29 which idler engages with the teeth of another gear wheel 8 that is secured on said counter shaft 6. Friction clutches 9 and 9′ are carried on said main shaft 1 by means of which motion is imparted to said pinion gears 4 and 7. Sprocket wheels 10 are secured on and rotate with said counter shaft 6 over which sprocket wheels the chains 10′ are carried. A cross bar 43 is secured on said chains 10′ and the handle 30 by which said chains are fastened together and engage with the rake-carrying handle 30. An extension shaft 11 is secured on the end of the shaft of said motor M, on which shaft 11 is carried the said worm pinion 2. On said shaft 11 is secured the pinion gear 12 the teeth of which mesh with the teeth of a gear wheel 13 carried on the shaft 14 that is counter to said extension shaft 11 and is the shaft which imparts motion to the air pump K. On said shaft 14 is carried the friction clutches 15 and 15′ to impart motion to the bevel pinions 16 and 16′ respectively carried on said shaft 14, the teeth of said bevel pinions 16 engage with the bevel gear 17 which in turn is secured on the shaft 18 which is herein called the frame moving shaft. On said shaft 18 is secured the worm 19 the teeth of which engage with the worm gear 20 that in turn is secured on the shaft 21. All of said shafts are mounted in suitable bearings secured on said frame F. On said shaft 21 is secured said track wheel H and on the same plane and on the under side of said frame F is journaled the said track wheel G, both of which are flanged and engage the curved rail D. A handle race is pivoted on said shaft 6 and carried on said frame F and is built of two opposed channel irons L secured in spaced apart relation to each other and parallel, and with their channels facing each other. Within which channels herein called, a race, the handle 30 is operated. On the front end of said handle race and secured to said channel irons L L, I provide two other sprocket wheels 22, over which said chains 10′ are operated. On the front end of said handle 30 is secured the rake blade 31 which may take the form of a hoe blade or have tines as preferred.

On the rear end of said handle are mounted the rollers 46, one on each side, which rollers are carried with said handle in its movements within said handle race and bear against the inner wall of each of said channel irons L. On forward end of said handle race are provided the guide rollers 32 which bear on the upper and lower sides of said handle 30. The handle is shown as and preferably made of an I-beam. Within said handle race are provided rollers 36 made to engage the web portion of said handle 30. On the front of said frame F are provided guides 35, which holds the front end of said channel irons L laterally, but leaves them free to move vertically. The adjustable stop 37 is secured on the under side of said handle race and bears against said channel irons L L at its upper end and is supported at its lower end upon the said frame F, and is used to direct the horizontal position of the blade end of said handle when used in the coke ovens in order to maintain and keep the lower portion of said blade 31 above the floor of the oven, preferably about one inch. In order that the fall of the handle race and handle may not be too severe on the said adjustable brace 37 a pair of spiral springs 38 are secured on the upper side of the frame F near the guide stay 35, the upper end of which springs will bear under the channel irons L when the air is out of the cylinder 33 and the rake is in the lower position, thus affording yielding support to said handle and channel. On the under side of said channel irons L and adjacent said guide stay 35 is pivoted one end of the piston stem 34. A piston secured on said stem 34 is operated in the air cylinder 33 which is pivoted on the under side of said frame F. An air hose P connects said air pump K with said air cylinder 33, an intermediate air reservoir preferably being used. Air under pressure is admitted to and exhausted from the cylinder 33 by any suitable mechanism, the operation of the piston being controlled by valve 44 arranged near the operator's seat. A seat N is provided for the operator and near it and pivoted to said frame F is the hand lever 23, which lever with links 45 and bell crank lever 58 enables the operator to shift the said clutches 9 and 9′, whereby they may impart motion as desired from the main shaft 1 to the counter shaft 6. A foot lever 28 is also pivoted on said frame F in front of the seat, which lever 28 is pivoted at one end to the shifting bar 39. The shifting bar 39 has two slots therein within which slots are operated the pivot pins of the clutch levers 40. Said pins are so positioned in said slots that when the shifting bar 39 is moved longitudinally in one direction one of said pins will engage in the end of one of the slots but be free to move in the other slot and if said shifting bar 39 is moved in the opposite direction the last mentioned pivot pin will engage with said bar and move its clutch while the other or first mentioned pivot pin will be free to move in its respective slot. Respective clutch levers 40 are the means used to move the clutches 15 and 15′ in the engagement with their respective bevel pinions. A spring 57 holds said shifting bar 39 in the normal position and both of said clutches 15 and 15′ out of engagement and when the

foot lever 28 is moved and thereby the bar 39 in either direction to shift one of said clutches, the spring 57 will return the shifting bar to normal position and disengage both clutches. Connected with the said lever 23 is a link rod 59, one end of which is pivoted to a safety lever 45 which is secured adjacent the rear end of said channel race L. A laterally projecting lug 48 is secured on said chains 10′ and when the handle 30 is moved to the rear of the apparatus to draw coke out of the oven in order to prevent injury to the apparatus by the operator throwing the handle too rapidly the cross bar 43 will engage the upper end of said lever 45 and thereby move lever 23 and its connections with said clutches 9 and 9′ and when said rake handle 30 is drawn too far forward by said chains 10′ the laterally extended lug 48 thereon will engage the lower end of said lever 45 and shift the clutches 9 and 9′ and reverse the motion of the apparatus and of said handle 30.

The operation of my apparatus is as follows:—

With power supplied by the motor M to the shaft 11 and thereby to the main shaft 1 which is rotated the operator by means of the hand lever 23 imparts the motion of said main shaft 1 to the counter shaft 6, and thereby to the sprocket wheels 10 and through the chains 10′ to the sprocket wheels 22. The said chains 10′ are operatively secured at one place thereon to the rear end of the handle 30 by means of the cross bar 43 which is rigidly secured to both chains and desiring to extend the handle with the rake blade 31 thereon into the oven Q, the operator will move the lever 23 and throw the clutch 9 which will cause an engagement of the pinion gear 4 with the intermeshing gear wheel 5 and at the same time the clutch 9′ will be released, and the pinion gear 7 will engage only with the idler gear 29 and there will be no engagement with the gear wheel 8. The rotation of said shaft 6 will move the sprocket chains 10′ longitudinally and thereby the handle 30 will be moved longitudinally within the guide channels L L, and a portion of said handle with the rake blade 31 thereon will be carried into the coke oven O. In order that said rake blade 31 will not engage with the coke as it enters the oven, compressed air is introduced into the air cylinder 33 by the air control valve 44 through the air hose P. When air is introduced into said cylinder 33 it will move the connecting rod 34 and raise the forward end of the channel race upwardly and sufficiently to pass the blade 31 over the coke within the oven. If the coke should be unbroken, as it frequently is when the fire is at first removed, the operator may drop the handle 30 and the forward end of the channel race L L, by releasing the air in cylinder 33. The force of the falling handle and blade will break up the coke, and the operator desiring to rake some of it from the oven will then reverse the travel of the chains 10′ by throwing the lever 23 in an opposite direction so that the clutch 9′ will cause the chain of gears 7, 29 and 8 to rotate. At the same time the clutch 9 is disengaged and leaves the pinion 4 and gear 5 out of engagement with shaft 6. The chains 10′ will be pulled longitudinally in the opposite or backward direction by the opposite rotation of the said shaft 6. The operation of introducing the rake blade into the oven and removing it may be continued until the coke in the path of the blade is all removed, then desiring to rake coke from the other parts of the oven he may swing the frame F, with all the mechanism carried thereon, on its pivot 42 and direct the handle 30 to the right or left of the position where it has been working. To move the frame F on its pivot the operator moves the foot lever 28 and the connecting bar 39, thereby shifting the levers 40 to engage one of the clutches with the desired beveled pinion 16 and rotate the shaft 18, and through the worm 19 impart rotary motion to the shaft 21. This will swing the entire frame to the right or left and rotate the wheels G and H over the curved track D. When the frame F is swung to the right the direction of the handle 30 will be to the left and the introduction and removal of the rake handle 30 and blade 31 into and from the oven will remove the coke therefrom. To remove the coke from the opposite side of the oven the operator would shift the other clutch 15 into engagement with its beveled pinion 16 and rotate said shafts 18 and 21 in the opposite direction and swing the frame F toward the left on its pivot 42 and the rake handle and blade may then be used by the operator introducing and removing them from the oven to rake the coke from that side of the oven. When the coke is raked out of the oven door, shown at 50 it falls into the chute 51 and is deposited by gravity on the endless elevator belt 52, which belt may be raised at one end to deposit the coke therefrom into a car or other conveyance as required.

Having thus described my invention and its operation I desire to secure by Letters Patent and claim:—

1. In a coke rake the combination of a wheel supported platform adapted to be run on a railway track, with a frame pivoted and supported at one point on said platform and supported by a curved track at other points; a handle race pivoted at one end to said frame and free to move vertically at its other end; a guide stay to hold said free end in a vertical plane over the pivot of said frame; an air cylinder; a connecting rod secured at its upper end to said handle race

and whose lower end is movable in said cylinder; means to introduce compressed air into said cylinder to raise and lower the free end portion of said handle race; a handle slidable in said handle race; a rake blade on one end of said handle; rollers on said handle race which bear against said handle; rollers carried on said handle which bear against the inside of said handle race; a rotatable shaft on which said handle race is pivoted; sprocket wheels secured on said shaft and rotatable therewith; other sprocket wheels mounted on the free end of said handle race; chains operable over said sprocket wheels; means to fasten one end of said handle to said chains whereby said handle is moved longitudinally in one direction within said race when said chains are made to travel in one direction by the first mentioned sprocket wheels, and in the opposite direction when said chains travel in the reverse direction; and a source of power to rotate said shaft in either direction as desired.

2. A coke rake comprising a wheel supported platform, a curved rail thereon; a frame pivoted at a point on said platform and movable on said curved rail; a motor carried on said frame; a shaft driven by said motor; a channel race pivoted at one end on said shaft and movable vertically over said pivot point at the other end; a handle slidable in said channel race; means connected with said shaft for reciprocating said handle in said channel race; and means to move the free end of said channel race vertically, said means consisting of an air cylinder and a piston rod operable therein.

3. In a coke-drawing machine, the combination of a rake handle, means for supporting and guiding the rake handle for movement in the direction of its length, means affording a pivotal support at the rear end of said supporting and guiding means, means connected to the front end of the said supporting and guiding means for raising and lowering it and means for moving the rake handle relatively to its support.

4. Apparatus according to claim 3 in which the means for raising and lowering the handle suport includes pneumatic means.

5. Apparatus as claimed in claim 3 in which the means for raising and lowering the handle support is such as to permit a quick lowering movement.

6. Apparatus as claimed in claim 5 in which there is a yielding support beneath the guiding and supporting means.

7. Apparatus as claimed in claim 3 including an adjustable stop at the front end of said supporting and guiding means.

8. In a coke-drawing machine, the combination of a rake handle, means for supporting and guiding the rake handle for movement in the direction of its length, means affording a pivotal support at the rear end of said supporting and guiding means, means connected to the front end of the said supporting and guiding means for raising and lowering it, means for moving the rake handle relatively to its support and means for automatically determining the limits of the movement.

9. Apparatus as claimed in claim 8 in which the automatic means includes means for reversing the direction of travel of the rake handle.

10. In a coke-drawing machine, the combination of a platform, a frame mounted near one end upon the platform for movement about a vertical pivot and means for moving the frame about said pivot, a rake handle, means upon the frame for supporting and guiding the rake handle for movement in a line passing through the said pivot, a horizontal pivot connection upon the frame for the supporting and guiding means near one end thereof and means upon the frame in proximity to the said vertical pivot for raising and lowering the free end of the supporting and guiding means.

11. Apparatus as claimed in claim 10 in which vertical guides are secured to the frame on each side of said supporting and guiding means.

In testimony whereof I have affixed my signature.

BUNZO WATANABE.