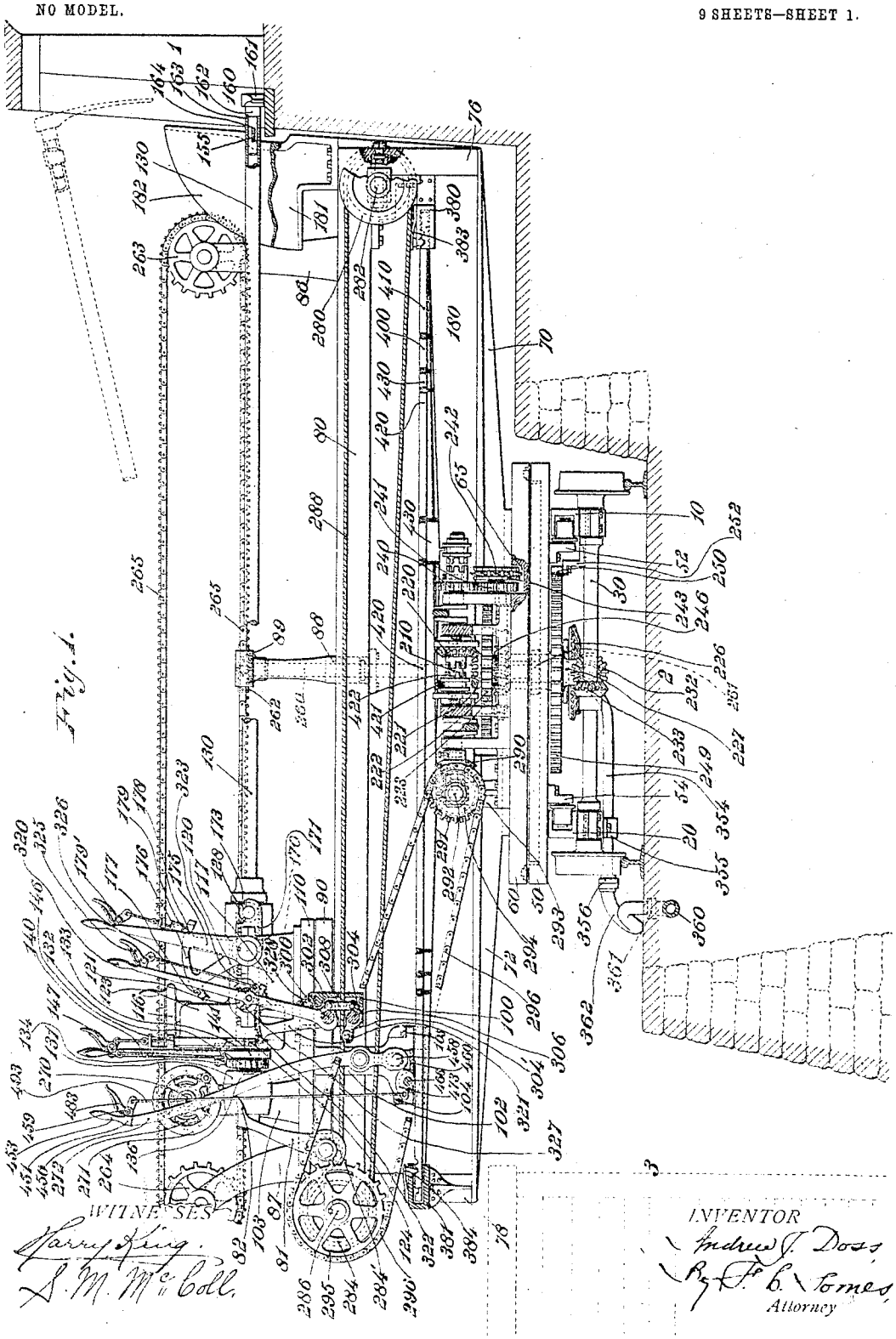
No. 775,211. PATENTED NOV. 15, 1904.

A. J. DOSS.

COKE OVEN DISCHARGING MACHINE.

APPLICATION FILED MAR. 17, 1904.

NO MODEL. 9 SHEETS—SHEET 1.



WITNESSES:

Harry King.

L. M. McColl.

INVENTOR

Andrew J. Doss,

By F. B. Comes,

Attorney

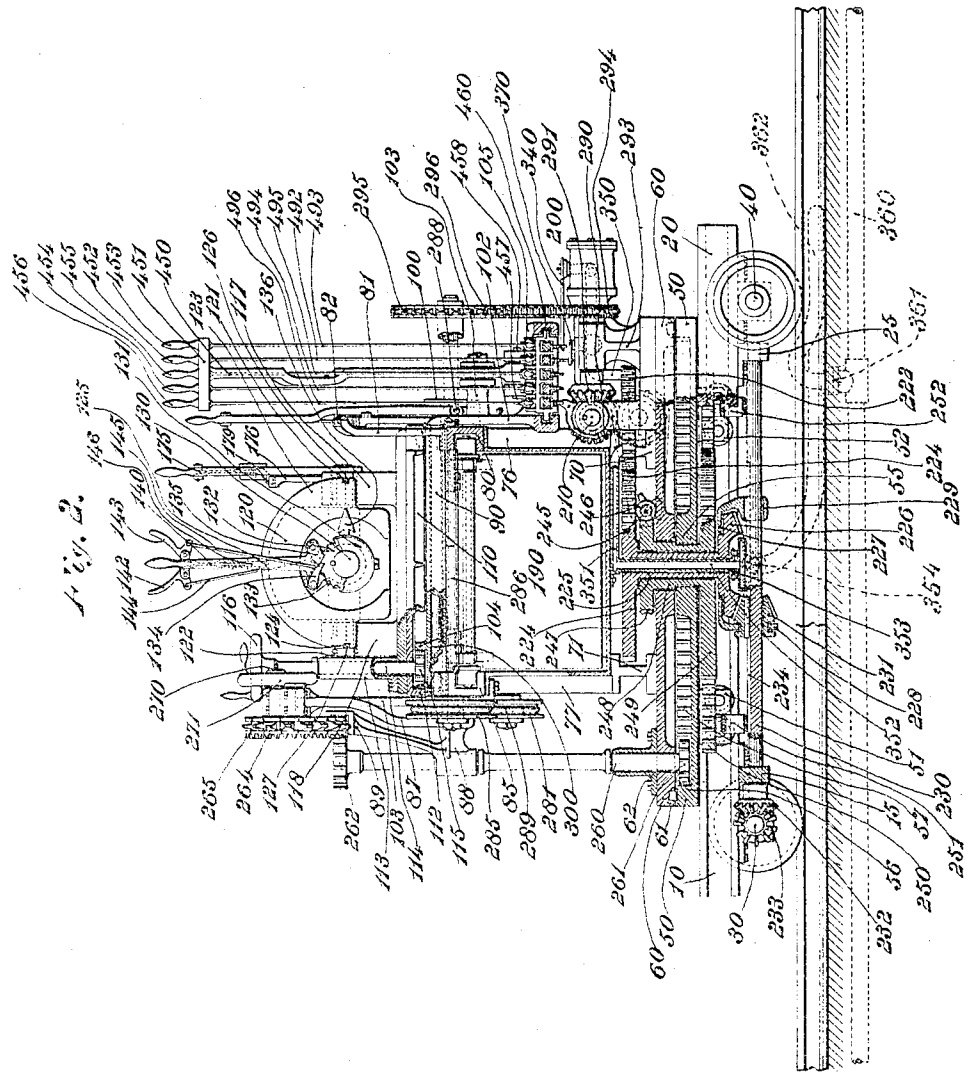
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A. J. DOSS.

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NO MODEL. 9 SHEETS—SHEET 2



WITNESSES

Harry King

L. M. M. Coll.

INVENTOR

Andrew J. Doss.

By F. C. Somes

Attorney.

No. 775,211. PATENTED NOV. 15, 1904.

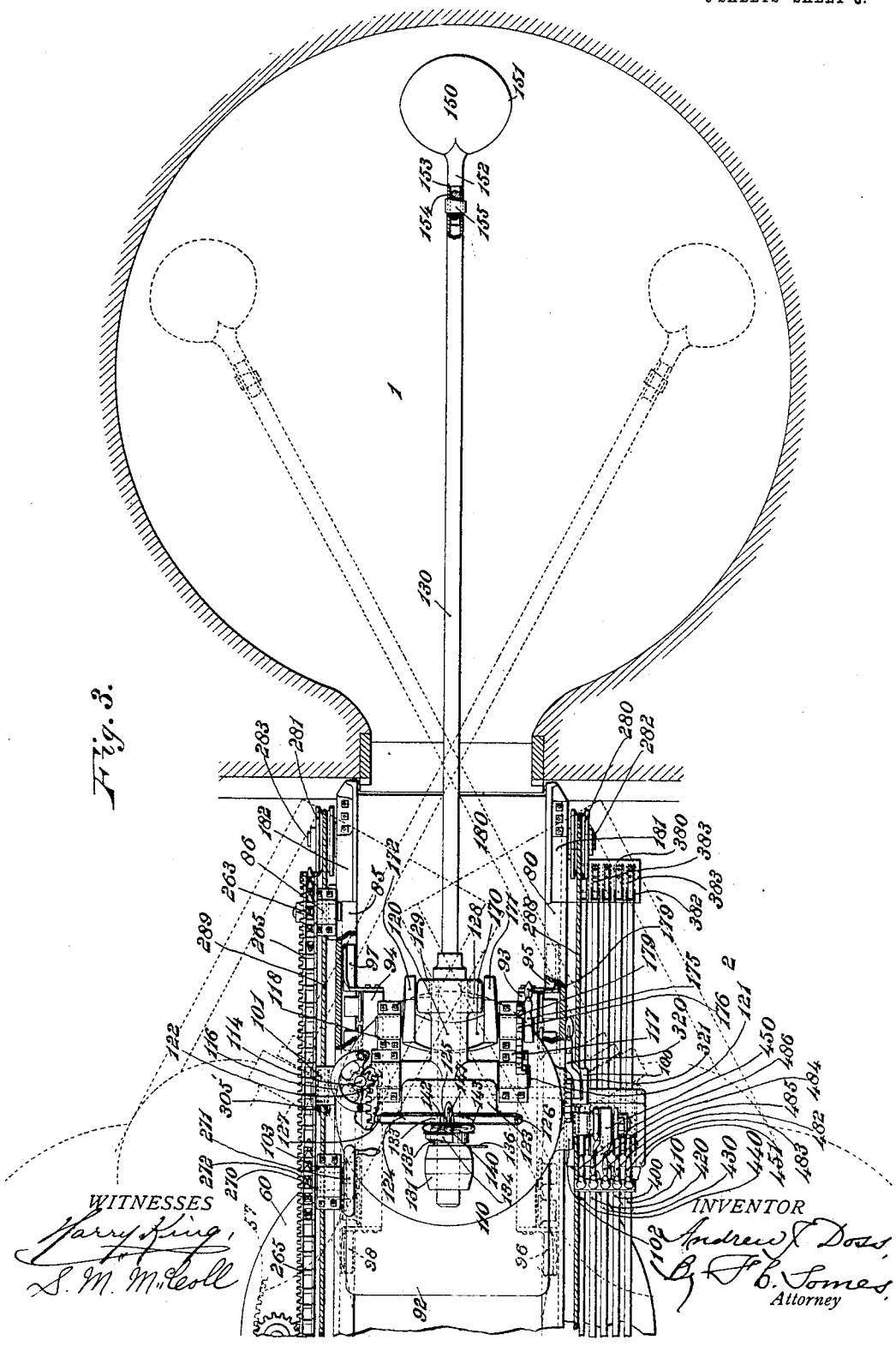
A. J. DOSS.

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NO MODEL. 9 SHEETS—SHEET 3.

Fig. 3.



WITNESSES

Harry King,

S. M. McColl

INVENTOR

Andrew J. Doss,

By F. B. Symes,

Attorney

No. 775,211. PATENTED NOV. 15, 1904.

A. J. DOSS.

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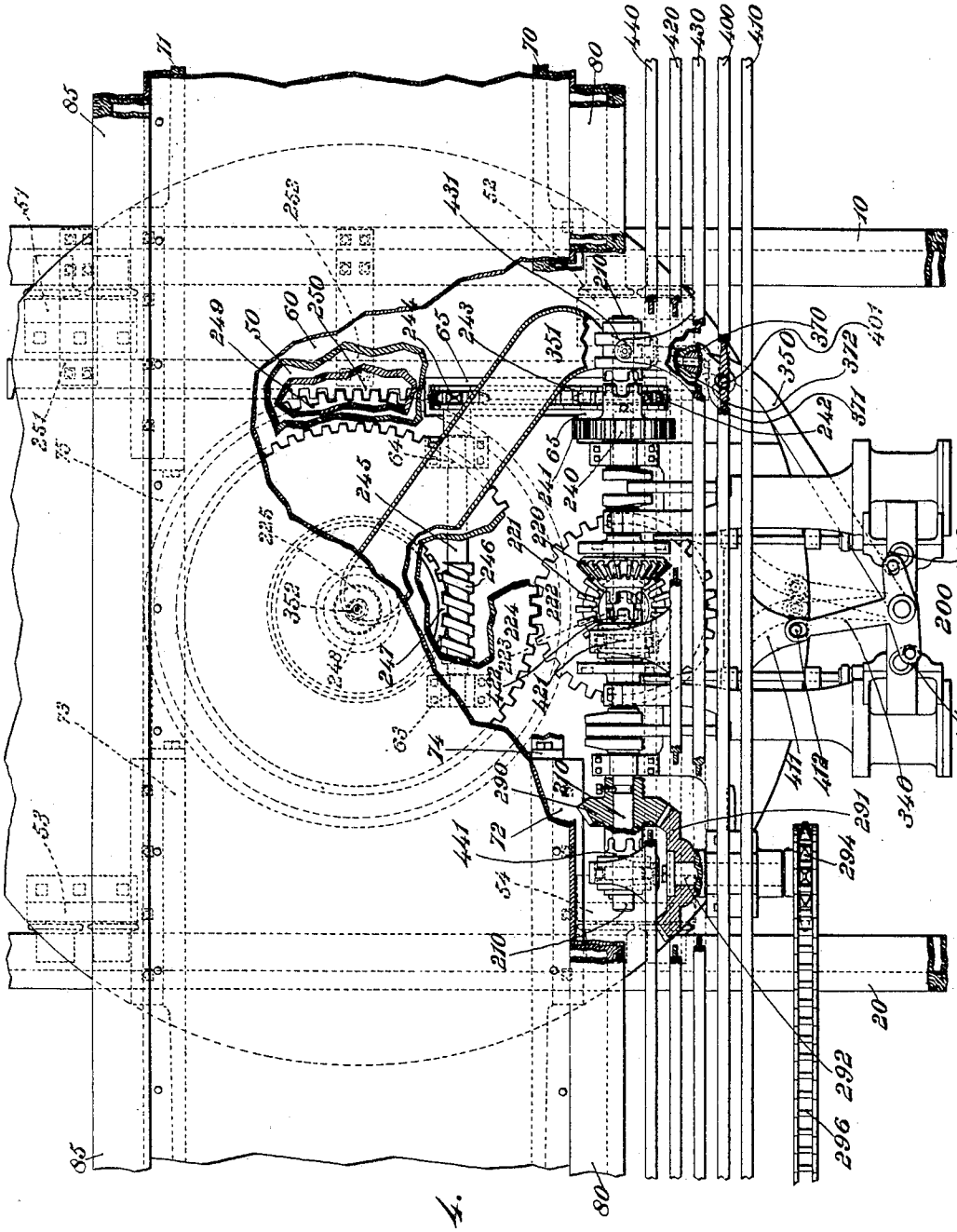


Fig. 4.

WITNESSES

Harry King.

S. M. McCall.

INVENTOR

Andrew J. Doss.

By F. C. Somes.

Attorney

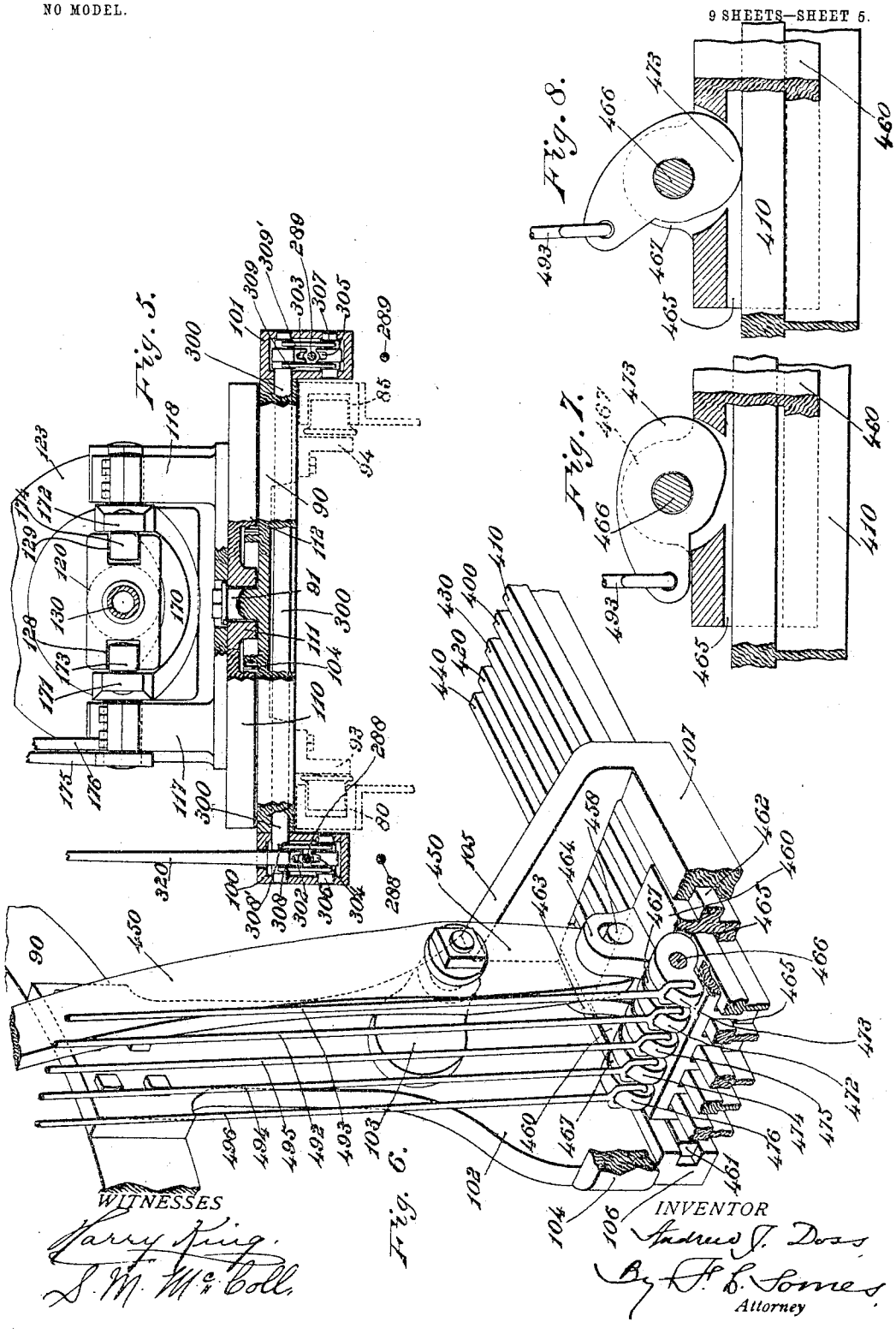
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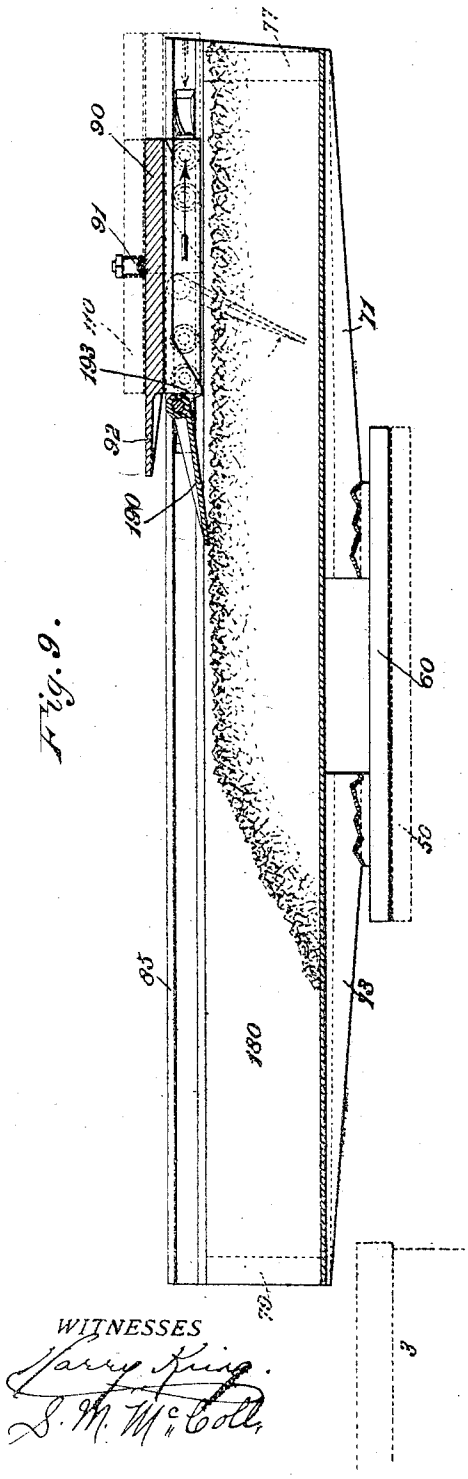


Fig. 9.

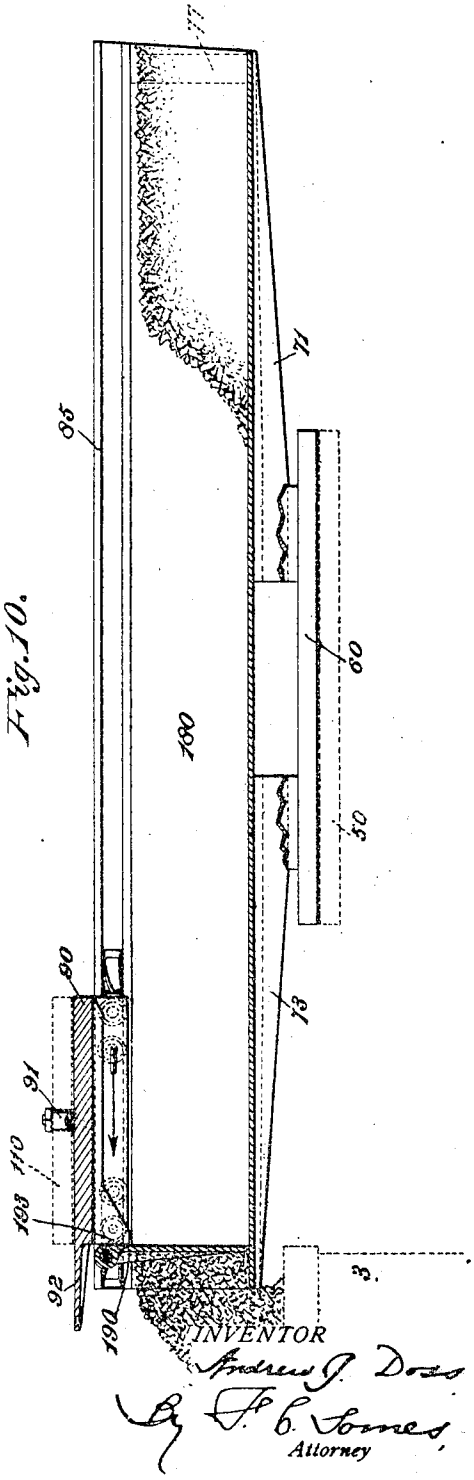


Fig. 10.

WITNESSES

Harry King.

L. M. McColl.

INVENTOR

Andrew J. Doss.

By F. B. Jones,

Attorney

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A. J. DOSS.

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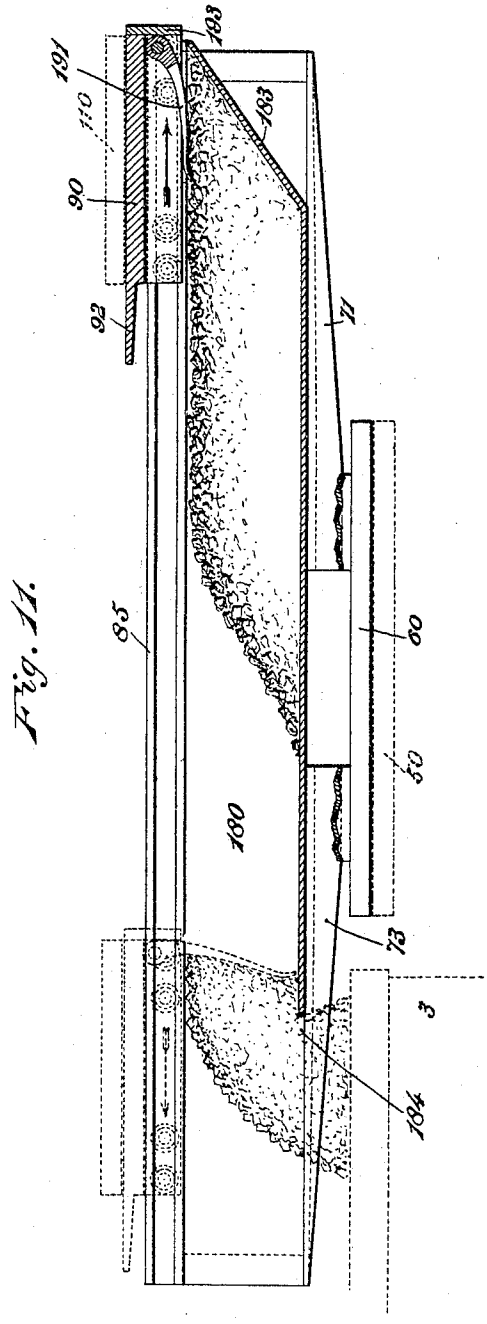


Fig. 11.

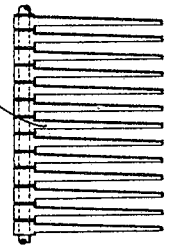


Fig. 13.

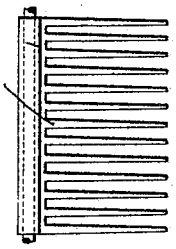


Fig. 12.

WITNESSES

Harry King.

L. M. McCall.

INVENTOR

Andrew J. Doss.

By F. C. Jones.

Attorney.

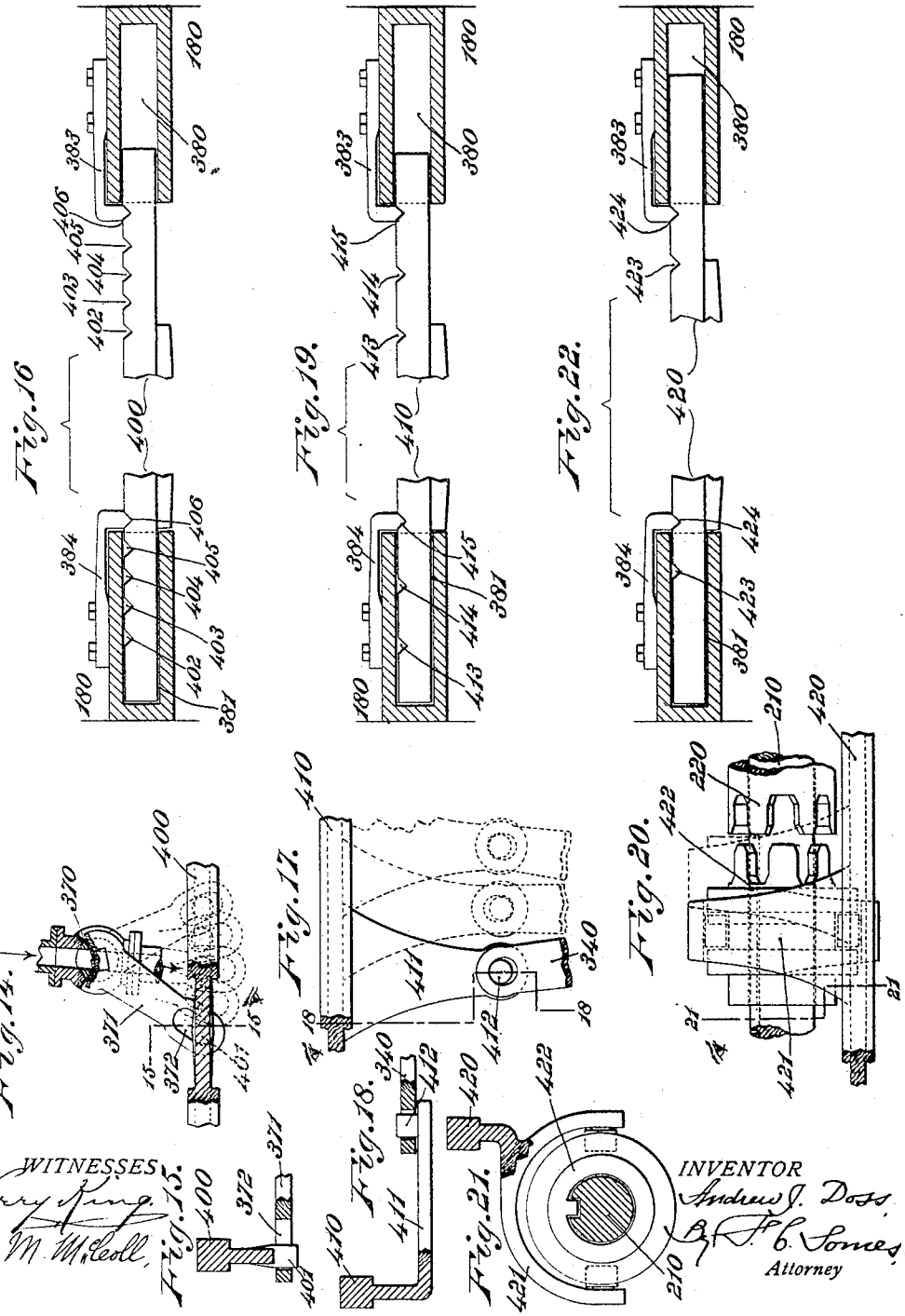
No. 775,211. PATENTED NOV. 15, 1904.

A. J. DOSS.

COKE OVEN DISCHARGING MACHINE.

APPLICATION FILED MAR. 17, 1904.

NO MODEL. 9 SHEETS—SHEET 8.



No. 775,211. PATENTED NOV. 15, 1904.

A. J. DOSS.

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APPLICATION FILED MAR. 17, 1904.

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Fig. 23.

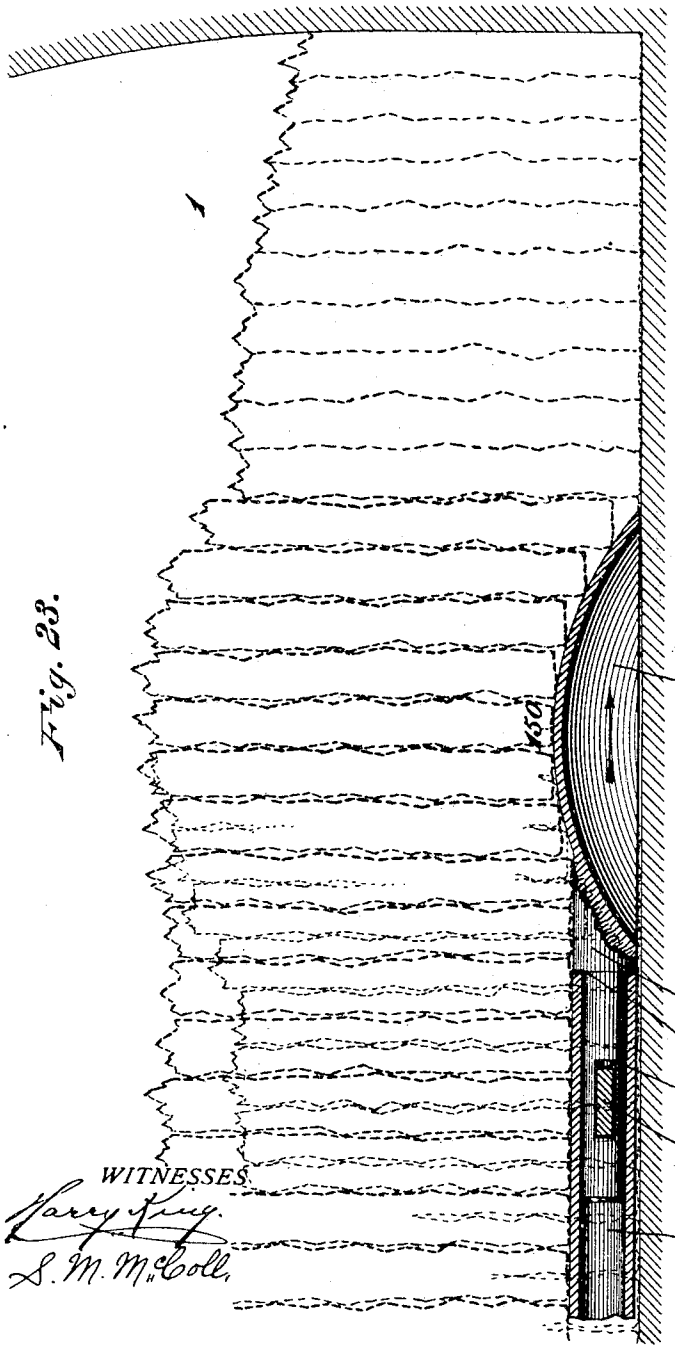
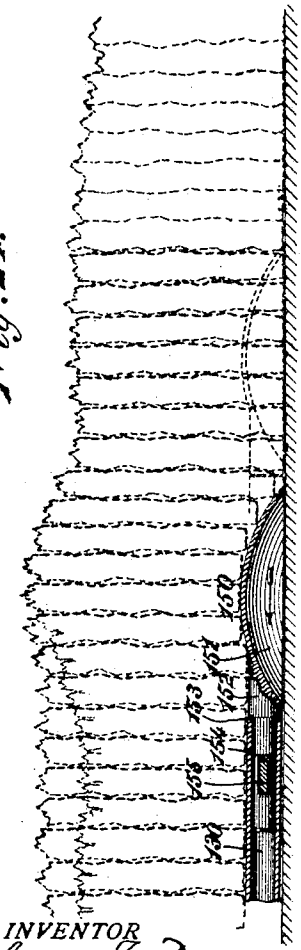


Fig. 24.



WITNESSES.

Harry King.

S. M. McColl.

INVENTOR

Andrew J. Doss,

By F. B. Jones,

Attorney

No. 775,211. Patented November 15, 1904.

UNITED STATES PATENT OFFICE.

ANDREW JACKSON DOSS, OF SWITCHBACK, WEST VIRGINIA, ASSIGNOR TO JAMES ELLWOOD JONES, OF SWITCHBACK, WEST VIRGINIA.

COKE-OVEN-DISCHARGING MACHINE.

SPECIFICATION forming part of Letters Patent No. 775,211, dated November 15, 1904.

Application filed March 17, 1904. Serial No. 198,562. (No model.)

To all whom it may concern:

Be it known that I, ANDREW JACKSON DOSS, a citizen of the United States of America, residing at Switchback, in the county of McDowell, in the State of West Virginia, have invented certain new and useful Improvements in Coke-Oven-Discharging Machines, of which the following is a specification.

This invention relates to a coke-puller designed to be operated by a machine for pulling coke from coke-ovens, and it is particularly adapted for discharging coke from beehive coke-ovens.

In the manufacture of metallurgical coke the oven known as the "beehive" oven, so called because of its dome-shaped form, has been generally adopted, being found to give the best results. In the burning of the coal the coke is produced in a caked mass having a vertical stratification, and it is desirable to avoid as much as possible breakage of the sticks and lumps extracted from the oven.

The principal object of the invention is to provide a machine for operating by power the coke-puller, commonly known as the "duck-bill scraper," in a manner similar to that by which it is manipulated by hand. To this end the duck-bill scraper may be given a chopping motion for loosening the coke, a lateral swing in either direction, and inward and outward thrusts to withdraw the coke, and all of these motions and various compound movements resulting from different combinations thereof may be effected by power.

Figure 1 of the accompanying drawings represents a side elevation of one embodiment of this machine, the engine-cylinders being omitted and several minor parts being in section, the machine being in position in front of a coke-oven preparatory to drawing the coke therefrom and delivering it into a receiving or coke car opposite the coke-oven. Fig. 2 represents an end elevation thereof, partly in section. Fig. 3 represents a horizontal section of a coke-oven and a top plan, partly in section, of the coke-drawing machine, the rear end of the cokeway being broken off and a coke-lifter being applied to the coke-puller bar for loosening the coke within the oven preparatory to the withdrawal thereof. Fig. 4 represents, on an enlarged scale, a plan view of the central portion of the machine, pieces being broken out of the bottom of the cokeway of the rotary base below the cokeway and the platform below said base, showing the mechanism for reciprocating the carriage on the car longitudinally. Fig. 5 represents a front elevation, partly in section, of the coke-puller carriage, the supporting-track therefor in dotted lines, the driving-cables, and the grip mechanism on said carriage for grasping the cables. Fig. 6 represents, on an enlarged scale, a perspective view of the lower portion of the mechanism for controlling the various movements of the apparatus, comprising a series of slide-bars, a carriage carrying a multilever, and a plurality of gripping devices connected with said multilever and operating on said bars, respectively, parts thereof being broken away. Fig. 7 represents, on a further enlarged scale, a side elevation of a fragment of one of the slide-bars actuated by the multilever, the grip-carriage connected with said lever, and a side elevation of one of the cams for gripping said slide-bar, said cam being in inactive position. Fig. 8 represents, on the same scale, a similar view to that shown in Fig. 7, showing the grip-cam in gripping position. Fig. 9 represents, on a smaller scale, a side elevation of the rotary base constituting a part of the main longitudinally-reciprocating carriage, a longitudinal section of the cokeway mounted thereon and open at both ends, a longitudinal section of the coke-puller carriage adapted to travel over said cokeway, and a coke-pusher swung from the rear end of said coke-puller carriage, the latter moving toward the oven end of the cokeway and the coke-pusher riding over the top of the mass of coke contained therein. Fig. 10 represents a view similar to that of Fig. 9, except that the coke-puller carriage is shown as moving toward the rear end of the cokeway and the coke-pusher as pushing the coke into the coke-car, the front end of said cokeway being closed. Fig. 11 represents a view similar to that of Fig. 9, the coke-puller carriage being shown in full lines as moving toward the oven and in dotted

lines as moving toward the delivery end of the cokeway, the coke-pusher being mounted at the front end thereof and the cokeway being provided at its front end with an inclined closure and at its rear end with a delivery-opening in its bottom. Fig. 12 represents a front elevation of the coke-pusher in the form of a fork. Fig. 13 represents a front elevation of the coke-pusher composed of a series of independently-swinging tines or fingers. Fig. 14 represents, on an enlarged scale, a plan, partly in section, of the cock for controlling the supply of motive fluid to the engine, the actuating-arm therefor, and a fragment of the slide-bar engaging said arm, parts being broken out and the dotted lines showing four different positions of the arm for regulating the cock. Fig. 15 represents, on the same scale, a vertical transverse section on line 15 15 of Fig. 14 of the parts shown in said figure. Fig. 16 represents, on the same scale, a longitudinal section through the boxes for supporting the opposite ends of the various slide-bars controlled by the multilever, the section being taken on a line which shows a side elevation of the end fragments of the slide-bar which controls the fluid-supply cock provided with five notches to correspond with the different positions of said cock. Fig. 17 represents, on the same scale, a plan of a fragment of the reversing-lever-actuating slide-bar provided with a lateral arm and the end of the reversing-lever engaged thereby, the dotted lines indicating two other positions of said parts. Fig. 18 represents, on the same scale, a transverse section on line 18 18 of Fig. 17 of the parts shown in said figure. Fig. 19 represents, on the same scale, a vertical longitudinal section through the end boxes heretofore referred to under the description of Fig. 16, the section being taken on a line which shows a side elevation of the ends of the reversing-lever slide-bar, said bar being provided with notches to lock it in three different positions. Fig. 20 represents, on the same scale, a plan of the clutch and slide-bar which control the reversing means of the coke-puller carriage, this slide-bar and clutch being likewise actuated by the multilever and being similar to other clutches and bars actuated by the multilever for controlling the movement of the machine-car and the reciprocation or adjustment of the main carriage which moves longitudinally on said car. Fig. 21 represents, on the same scale, a transverse section on line 21 21 of Fig. 20 of the parts shown in said figure. Fig. 22 represents, on the same scale, longitudinal sections of the end boxes before described for supporting the ends of the various slide-bars actuated by the multilever, the section in this case representing in side elevation the opposite end fragments of the slide-bar which controls the reciprocation of the coke-puller toward and from the oven. Fig. 23 represents, on a large scale, a vertical section through a portion of a coke-oven, showing by dotted lines the coke therein, and a longitudinal section of a coke-loosener on its inward stroke operating to lift the coke from the bottom of the oven and loosen it in vertical stratas preparatory to its removal from the oven by the coke-puller. Fig. 24 represents, on a smaller scale, a section of the coke-oven, the coke therein, and the coke-loosener on its outward stroke along the bottom of the oven.

The same reference-numerals indicate corresponding parts in all the figures.

The drawings show an arrangement of a coke plant in which coke-ovens, as 1, are disposed in a row or series. A railway-track is disposed on a level or plane 2 in front of the series of ovens, and coke-cars, as 3, travel below the plane 2, substantially parallel with the track on said plane. The machine-car carrying the coke-drawing mechanism travels along the track between the ovens and the track on which travel the coke-cars for conveying away the coke, the track-levels being preferably so arranged that the coke-conveyer of the coke-drawing machine may take the coke from the door of the oven and discharge it into the tops of the coke-cars. In this operation there is no handling of the coke between the drawing thereof from the oven and its discharge into the train of coke-cars.

A car traveling on the track adjacent to the ovens and hereinafter called the "machine-car" supports the coke-drawing mechanism. This car has preferably a skeleton frame comprising two longitudinal side rails 10 and 20, composed, preferably, of **U**-shaped angle-bars, disposed on their sides and resting, respectively, on journal-boxes supported on car-axles 30 and 40. These side bars have their open faces toward each other and are connected by cross-bars 15 and 25 and other suitable braces.

The coke-drawing mechanism is preferably mounted on a carriage adapted to move longitudinally on the machine-car for the purpose hereinafter described. This carriage in its preferable form comprises a traveling platform 50 in skeleton or other construction and a rotary or swiveling base 60, adapted to turn thereon. The platform 50 is preferably circular and provided on its under side with dependent lugs 51 and 52, carrying flanged wheels which travel in the recess of the side rail 10, and with dependent lugs 53 and 54, carrying flanged wheels which travel in the opposite side rail 20. The platform is also provided with a central hub 55 and with a circumferential upward flange 56, provided on its inner periphery with a circular rack 57, as clearly shown in Fig. 2.

The swiveling base 60 is preferably provided on its under side with a circumferential downward flange 61, preferably provided with antifriction-rolls, which are journaled in recesses in said flange and adapted to travel on

the upward flange 56 of the platform 50. In this form of construction the rack 57 is concealed and protected from dust and coal. This swiveling base is provided near its periphery with a vertical shaft-bearing 62 and near its center with horizontal shaft-bearings 63 and 64 (shown in dotted lines in Fig. 4) and with a recess 65 tangent to a circle near the center, as shown in Figs. 1 and 4 and for the purpose hereinafter described.

The coke-drawing mechanism and the driving engine or motor are mounted on the swiveling base 60, and the support shown therefor comprises four sills 70 and 71, 72 and 73, as shown in Figs. 1, 2, and 4, the sills 70 and 71 being disposed on opposite sides of the center of the base and projecting parallel to each other beyond the periphery thereof and the sills 72 and 73 being similarly disposed relative to each other on the other side of the center of the base and in line with the sills 70 and 71, respectively. The sills 70 and 72 are connected at their inner ends by a short connecting-sill 74 and the sills 71 and 73 are likewise connected at their inner ends by a short sill 75. These sills project sufficiently from opposite sides of the base to extend from the front line of the ovens on one side of the machine-track to the line of coke-cars for receiving the coke on the other side of said track. The sills 70 and 72 are provided at their outer ends, respectively, with upright standards 76 and 78, which are made integral therewith or attached thereto, and the sills 71 and 73 are provided at their outer ends, respectively, with corresponding upright standards 77 and 79. A track for a reciprocating coke-puller carriage is supported on these standards and preferably comprises a U-shaped rail 80, disposed on the standards 76 and 78, and a U-shaped rail 85, disposed on the standards 77 and 79. These rails have their open faces toward each other and form ways in which the coke-puller carriage travels. The rail 80 is provided on its rear end with an upright arm 81, having at its upper end a tripping-cam 82, for the purpose hereinafter described, and the rail 85 is provided at its opposite ends with standards 86 and 87 and with a central standard 88, having a sprocket-chain guide 89, for the purpose hereinafter described.

A coke-puller carriage of any suitable construction is adapted to reciprocate by any suitable means on the track 80 85 toward and from the oven. This carriage preferably comprises a traveling platform 90 and a rotary table 110, adapted to turn thereon, the platform being provided with a central stud 91 and the table with a tubular boss 111, adapted to receive said stud, as shown in Fig. 5. The platform 90 is preferably rounded at its front end and provided at its rear end with an extension 92, which affords ample standing room for the engineer. This platform is provided underneath on opposite sides with longitudinal angle-bars 93 and 94 parallel with each other, as shown in dotted lines in said figure. These angle-bars are provided with outwardly-projecting journal-studs having flanged wheels which travel in the U-shaped rails 80 and 85. These angle-bars are provided at their opposite ends with plows 95, 96, 97, and 98, which serve to clear said rails of any coke which may be lodged therein. Brackets or boxes 100 and 101 depend from this platform on opposite sides thereof and serve as supports for cable-grips, hereinafter described. A dependent bracket 102 extends below the bracket 100 on the near side and serves as a support for the multilever and it grippers, hereinafter described, which act on a series of slide-bars for different actuating mechanisms. This platform is provided on the far side of its extension 92 with an upright standard 103, (shown in Figs. 1, 2, and 3,) and on its under side with a circular rack 104, preferably somewhat smaller in diameter than the table 110.

The rotary table 110 is provided with a downward circumferential flange 112, which is preferably provided with antifriction-rollers which travel on the platform 90 when the table is rotated. A vertical shaft-bearing 113 is mounted on the rotary table, and a shaft 114 is journaled therein and extends below said table and is there provided with a pinion 115, which meshes with the circular rack 104 attached to the platform 90. This shaft is provided at its upper end with a hand-wheel 116, which is actuated by the operator to turn the table to any desired position.

The coke-puller proper is mounted on the coke-puller carriage in such a manner as to be swung vertically and oscillated axially by mechanical means, the lateral movement being obtained by the swiveling of the rotary table 110 or of the main base 60 or both. Two standards 117 and 118 are mounted on the rotary table 110 parallel with each other on opposite sides thereof. A vertically-oscillating coke-puller socket 120 is provided with trunnions 121 and 122, journaled in bearings at the rear of said standards, and in rear of said trunnions with a counterweight 123. A coke-puller bar 130 is supported at its rear end in said socket and provided at its front end with a detachable coke-loosener or with a coke-puller which is interchangeable with the coke-loosener. The coke-puller bar extends slightly beyond the rear end of the socket and carries a supplemental counterbalancing-weight 131. Means are provided for axially oscillating the coke-puller bar to adjust the coke puller or scraper at different angles, as desired. Any suitable means may be used for this purpose. The means shown comprise two ratchet-wheels 132 and 133 fixed on the rear end of said bar, the teeth of said wheels being oppositely disposed relatively to each other. A lever 140 is provided at its inner end with an eye or col-

lar 141, which turns loosely on the bar 130 between the ratchet-wheels 132 and 133. Spring-pawls 134 and 135 are pivoted on said lever and engage said ratchet-wheels, respectively, on the swinging of the lever in either direction. The lever 140 is provided on opposite sides of its handle end with lugs, to which angular levers 142 and 143 are pivoted. The angular lever 142 is connected by a connecting-rod 144 with the pawl 135 and the angular lever 143 is connected by a rod 145 with the pawl 134. An indicator 136 in the form of an arrow or otherwise is attached to the counterweight 131 or otherwise connected with the bar 130 to show the position of the coke-puller within the oven under or in contact with the coke. This indicator is preferably adjusted to project from the coke-puller bar at the same angle that the coke-puller projects. A swing of the lever 140 toward the right, as shown in Fig. 2, will cause the pawl 134 to engage the ratchet-wheel 132 and the coke-puller bar will be oscillated on its axis in the same direction a proper distance to bring the coke-puller at the end thereof to the desired angle, the other pawl, 135, moving with its ratchet-wheel without action thereon. A swing of the lever toward the left will cause the pawl 135 to engage the ratchet-wheel 133 and turn the bar and coke-puller in the opposite direction, the pawl 134 being in this instance inoperative. When it is desired to turn the coke-puller bar through an arc greater than will be imparted thereto by a single convenient swing of the lever 140, one of the angular levers 142 or 143 is grasped in conjunction with said lever and the actuating-pawl is lifted out of contact with its ratchet-wheel while the lever is swung back to take a new grip. In this way the coke-puller bar 130 may be oscillated in either direction through three hundred and sixty degrees, more or less, as necessary. Means are provided for locking the lever 140 in three permanent positions. The means shown comprise a locking-plate 124, which may be in the form of a flange on the counter-weight 123. This locking-plate forms a semicircular arc provided with a notch 125 at its top and two opposite side notches 126 and 127 near its base. A spring-actuated bolt 146 is mounted on said lever and controlled by an angular lever 147, said bolt being adapted to ride on the periphery of the locking-plate 124 to engage any of its notches when the lever is swung into position to cause the bolt to register therewith. The coke-puller bar 130 is designed to carry at its outer end either a lifting coke-loosener or a coke-puller, the latter being preferably of such construction as to adapt it for use either as a claw or as a scraper for the coke. The lifting coke-loosener and coke-puller are detachable from the coke-puller bar and are designed to be used interchangeably and in succession, the coke-loosener operating to loosen the caked coke and the coke-puller to claw and withdraw the loosened coke.

The particular form of lifting coke-loosener 150 illustrated in the drawings comprises a convex or inverted-dish-shaped body 151, provided with a radial shank 152, said shank having a shoulder 153 and a slot 154, as shown in Figs. 3, 23, and 24. A wedge-shaped or other key 155 is adapted to pass through slots in the outer end of the bar 130 and through the slot 154 in the shank of the coke-loosener, whereby the latter is locked to said bar. Any other suitable means for attaching the scraper may be employed.

The coke-puller 160 is preferably similar in form to that commonly used in hand coke-pulling and known as a "duck-bill" coke-puller, consisting of a single elongated prong or claw 161 and a shank 162 at right angles to the claw, or thereabout, said shank being also provided with a shoulder 163 and with a slot 164, as shown in Fig. 1. The body of the shank is adapted to fit within the outer end of the bar 130 down to the shoulder 163, and the key 155 or other means is used for locking the puller in position on the puller-bar. The slot in the shank of the loosener is preferably in a horizontal plane with reference to the body thereof, so as to avoid contact of the key with the bottom of the oven, and the slot in the shank of the coke-puller is preferably in line with the claw, so that when the latter is turned on its side and used as a scraper the key will not come in contact with the bottom of the oven. The shanks of the coke-loosener and coke-puller are made to fit loosely in the socket end of the coke-puller bar to provide for expansion under the heat of the oven.

Means are provided for swinging the coke-puller bar in a vertical plane to cause the coke-claw to rise and fall to engage the coke within the oven. These means are preferably such as are within easy reach of the operator and when constructed as herein shown comprise a yoke 170, disposed between the standards 117 and 118 in front of the bearings for the trunnions of the oscillating socket which carries the coke-puller bar 130. This yoke has trunnions on its opposite sides which engage bearings in the front portions of said standards, and it is provided with crank-arms 171 and 172, which extend parallel with the coke-puller bar on opposite sides of the front portion of the oscillating socket. These crank-arms are provided at their outer ends with inwardly-projecting crank-pins 173 and 174, which engage longitudinal guideways 128 and 129 in opposite sides of the front portion of the oscillating socket 120, as shown in Figs. 1, 3, and 5. A lever 175, herein called the "clawing-lever," is secured to one of the trunnions of the yoke 170. A locking-plate 176 is attached to the standard 117 and provided with notches 177 and 178, and the clawing-lever is provided with a spring-actuated bolt

179, adapted to ride over said locking-plate, and with a bell-crank lever 179′ for releasing the bolt. By oscillating this clawing-lever the operator can easily swing the counter-weighted coke-puller bar and raise and lower the coke-puller and perform a clawing operation.

A cokeway or chute 180 is disposed beneath the track 80 85 and extends from end to end thereof, and the coke drawn from the oven on one side of the machine is pushed through this chute into the coke-cars on the other side thereof. This cokeway is preferably rectangular in cross-section and composed of heavy sheet metal. It rests at its bottom on the sills mounted on the swiveling base 60. The upper edges of the sides of the cokeway are provided with outward flanges which are secured to the under surfaces of the rails 80 and 85. This cokeway may be open at both ends and along its top. Upright wings 181 and 182 (shown in Figs. 1 and 3) are preferably disposed on opposite sides of the front end of the track from which the cokeway is suspended and project above the oven-hearth on opposite sides of the oven-door and serve as guides to direct the coke withdrawn through the door into the cokeway below. Means are provided for pushing the coke through the cokeway. The means shown for this purpose consists of a pusher 190, attached to the reciprocating coke-puller carriage and adapted to shove the coke through the cokeway 180 from the front end thereof and deliver it at the rear end thereof into a coke-car. This pusher is preferably hinged to one end of the platform 90 of the coke-puller carriage and is preferably adapted to swing freely in a vertical plane from an active vertical position to an inert horizontal position. The pusher may be in the form of an apron, as shown in Figs. 2, 9, and 10, or in the form of a comb 191, as shown in Figs. 11 and 12, or in the form of a series of independently-swinging fingers 192, as shown in Fig. 13. Stops, as 193, serve to prevent the apron from swinging forward beyond a vertical plane in its down position. As the coke-puller carriage moves toward the oven to grasp a charge of coke therein the coke-pusher rides freely over any coke that may be contained in the cokeway, and as said carriage moves backward the end of the coke-pusher is thrust downward into the mass of coke, as indicated in dotted lines in Fig. 9, and pushes the coke behind it along the cokeway and over the outer end thereof into the coke-car, as shown in Fig. 10. The coke-pusher is shown as pivoted to the rear end of the platform of the coke-puller carriage in Figs. 9 and 10 and to the front end thereof in Fig. 11. In the form shown in Fig. 13 separate fingers may swing independently of others in passing over large lumps. The cokeway 180 may be provided at its front end with an inclined bottom 183, as shown in Fig. 11, down which the coke slides into the trough as it is drawn from the oven. The cokeway may be provided at its rear end with an opening 184 in its bottom, as shown in Fig. 11, through which the coke may fall into the car as it is shoved through the cokeway by the pusher, in which case the track for the coke-cars will preferably be in such relation to the coke-puller that the coke discharged through said bottom opening will fall into the coke-cars located immediately under said opening.

A motor for driving the machine-car and the various mechanisms comprised in the coke-drawing apparatus is mounted on the swiveling base 60. This motor may be actuated by electricity, steam, air, or other motive fluid. The drawings illustrate a duplex compressed-air engine 200, having a driving crank-shaft 210, which projects at its opposite ends beyond its supports in the engine-frame. This driving-shaft is provided with means for transmitting motion to the various mechanisms of the apparatus which are driven by power. The driving mechanism for causing the machine-car to travel along the track from oven to oven comprises a beveled gear-wheel 220, loose on said driving-shaft. This beveled wheel 220 meshes with a beveled gear-wheel 221, which is integral with or constitutes a flange upon a cog-wheel 222, which rotates on a vertical stud 223 on the bed-plate of the engine, as shown in Figs. 1 and 4. This cog-wheel 222 meshes with a larger cog-wheel 224, which is fixed on a hollow shaft 225, which extends downward through the axis of the swiveling base. This hollow shaft is provided at its lower end with a beveled gear 226, which meshes with a sliding beveled pinion 231, disposed on a longitudinal shaft 230, journaled in the cross-bars 15 and 25. A yoke 227 is suspended on the beveled gear-wheel 226 and provided at one end with a dependent collar 228, which engages the grooved end of the sliding pinion 231, and at the other end with a dependent guide 229, which slides on the shaft 230. The longitudinal shaft 230 is provided with a longitudinal groove 234, and the sliding pinion 231 is provided with a spline which engages said groove and causes the shaft and pinion to rotate together. A beveled pinion 232 is fixed to the shaft 230 at one end thereof and meshes with a beveled pinion 233 on the car-axle 30. By this mechanism motion is communicated from the driving-shaft of the engine to one of the axles and the machine is made to travel along the track in either direction according to the direction of motion of the engine controlled by the reversing-valve. Any suitable means may be employed for switching this mechanism into operative connection with the driving-shaft. The means herein shown for this purpose will be hereinafter described.

The means for reciprocating the carriage carrying the coke-drawing mechanism longi-

tudinally along the machine-car for the purpose of enabling the coke-puller to operate obliquely to gather coke from the sides of the oven comprises when constructed as shown in Figs. 1, 2, and 4 a gear-wheel 240, loose on the driving-shaft 210 and meshing with a corresponding gear-wheel 241, attached to a sleeve disposed on a lateral stud projecting from one of the engine-standards. This sleeve is provided at its outer end with a sprocket-wheel 242, and a sprocket-chain 243 connects the latter with a sprocket-pinion 244 on a worm-shaft 245, which is journaled in the bearings 63 and 64 on the swiveling base 60. This worm-shaft has a worm 246, which meshes with a worm-wheel 247, attached to the upper end of a tubular shaft 248. This tubular shaft extends downward through the center of the swiveling base 60 and traveling platform 50 and surrounds the hollow shaft 225 heretofore described, and it is provided at its lower end below the platform 50 and above the crown-wheel 226 with a gear-wheel 249. A longitudinal rack-bar 250 is supported on brackets, as 251 and 252, attached to the side rail 10 of the car-truck, and extends longitudinally thereof, and this rack is engaged by said gear-wheel 249. Means are provided, conveniently located for manipulation by the operator, to switch this mechanism into and out of gear with the driving-shaft, which means will be hereinafter described.

Any suitable mechanism for rotating the swiveling base 60 may be used. The mechanism shown comprises a vertical shaft 260, supported in the shaft-bearing 62, attached to the rotary base 60, and in the vertical shaft-bearing of the bracket 88, attached to the frame mounted on said rotary base. This shaft extends through a hole in the base and is provided at its lower end with a pinion 261, which meshes with the internal gear 57 of the platform 50. The upper end of this shaft is provided with a pinion 262. Idler sprocket-wheels 263 and 264 are supported on the end standards 86 and 87 and carry an endless sprocket-chain 265. This sprocket-chain is composed of links which are provided on their outer edges with lateral gear-teeth, which form a continuous gear and engage the pinion 262 of the vertical shaft 260, whereby the latter may be rotated in either direction. The center guide 89, attached to the standard 88, holds the chain-gear in contact with said pinion, as hereinafter described. Actuating mechanism for this gearing is mounted on the coke-puller carriage within convenient reach of the operator. This mechanism comprises a stub-shaft 270, located at the upper end of standard 103, and is provided at one end with a hand-wheel 271 and at the other end with a sprocket-wheel 272, which travels with the coke-puller carriage and is in continuous engagement with the sprocket-chain 265. By turning this wheel 271 in one direction or the other the operator may transmit motion through the gearing just described to the pinion which meshes with the circular rack of the traveling platform 50, and thereby cause the swiveling base 60 to turn in either direction, as indicated in dotted lines in Fig. 3.

Any suitable mechanism may be employed for reciprocating the coke-puller carriage. That shown comprises idler grooved pulleys 280 and 281, disposed on lateral studs 282 and 283 at the front end of the rails 80 and 85, and grooved driven pulleys 284 and 285, disposed on a transverse shaft 286 at the rear ends of said rails. An endless cable 288 passes over the near idler-pulley 280 and near driven pulley 284, and a similar cable 289 passes over the off idler-pulley 281 and the off driven pulley 285. The studs 282 and 283 may be adjusted longitudinally to vary the tension of the cable. The transverse shaft 286 is located in a plane above the plane of the studs, which support the idler-wheels of the front end to avoid interference with the discharge of the coke at the rear end of the coke-chute. Then to hold the upper runs of the cables in horizontal position guide-pulleys, as 284′, are disposed on studs attached to the rails 80 and 85 adjacent to the driven pulleys 284 and 285. These guide-pulleys 284′ engage the upper runs of the cables adjacent to said driven pulleys and hold said runs in a horizontal plane.

Any suitable mechanism may be employed for driving the shaft 286. The mechanism for this purpose will now be described. A beveled gear 290 is disposed on the driving-shaft 210 and meshes with a beveled gear 291, disposed on a lateral stub-shaft 292, journaled in a bracket 293, attached to the bed-plate of the engine. This shaft 292 is provided with a sprocket-wheel 294. The transverse shaft 286 at the rear end of the coke-pulling apparatus is provided with a sprocket-wheel 295, and a sprocket-chain 296 passes over the sprocket-wheels 294 and 295 and transmits motion from the former to the latter, whereby said transverse shaft is rotated in either direction, according to the direction in which the engine is running. Any suitable means may be employed for throwing this mechanism into and out of gear. The mechanism shown for this purpose will be hereinafter described.

A cable-grip mechanism is disposed on the coke-puller carriage and adapted to grip the cables above described whenever it is desired to move the carriage toward or from the oven. Any suitable cable-grip mechanism may be employed for this purpose. The grip mechanism shown comprises a transverse shaft 300, which is journaled on the traveling platform, as shown in Figs. 1, 2, and 5. This shaft is provided at its opposite ends with grip-cams 302 and 303, which coact, respectively, with corresponding grip-cams 304 and 305, supported on studs 306 and 307, disposed

below the shaft 300. The grip-cams 302 and 304 on the near side of the apparatus are connected by links 308 and 308′, and the coacting grip-cams 303 and 305 of the off side are connected by links 309 and 309′. The lower cam 304 is provided with a rearwardly-projecting arm 304′, having a grooved friction-roller which engages the under side of the upper run of the near cable 288, and the lower off cam 305 is likewise provided with a rearwardly-projecting arm 305′, having a grooved antifriction-roller which engages the off endless chain 289. These arms serve to hold these runs of the cable out of contact with the grip-cams when the latter are disengaged. Dependent brackets 100 and 101, hereinbefore referred to, serve as supports for the studs 306 and 307. These brackets are boxed on their front portions and provided with holes through which the upper runs of the cable pass. These boxings prevent coke-dust from clogging the grip-cams. An actuating-lever 320 for the grip mechanism is locked to the shaft 300 on the near side of the machine. A lever-lock bracket 321 is attached to the platform 90 adjacent to the lever 320 and provided with an arc-shaped ratchet 322. The lever 320 is provided with a spring-pawl 323, pivoted to the lever just above said ratchet, said pawl being normally in contact with said ratchet. The actuating-lever 320 is provided at its handle end with a spring-actuated bell-crank finger-lever 325, which is connected by a rod 326 with said pawl, whereby the latter may be lifted out of engagement with the arc-shaped rack. A spring 328 is connected at one end with the grip-lever 320 and at the other end with the dependent bracket 310 and serves to pull the lever 320 into position to hold the grip-cams normally out of contact with the cables.

The machine is provided with automatic devices for releasing the grip mechanism from the traveling cables whenever the coke-puller carriage reaches the limit of its backward movement, so as to prevent any injury to the machine in case the attendant should omit to actuate the grip-lever at the proper time. The mechanism shown for this purpose comprises the standard 81, fixed to the rear end of the inner rail 80 and provided at its upper end with the cam 82, hereinafter described, which is engaged by the rear extension 327 of the pawl 323 when the coke-puller carriage reaches the limit of its outward movement. The pawl is thereby disengaged from the lever-lock rack, and the spring 328 operates to swing the lever forward, turning the shaft 300 and releasing the grippers on both sides of the machine from the cables.

The engine 200 is provided with a suitable reversing-lever, which may be in the form of a T-shaped lever 340, as shown in Figs. 2 and 4. The T end of this lever is connected with cranks 341 and 342, attached to the spindles of the reversing-valves for the motor-cylinder, and the shank end thereof is connected with an actuating mechanism hereinafter described.

The means for conveying the motive fluid to the engine are under suitable control by the operator. A supply-pipe 350 is connected with the motor. This supply-pipe connects with a channel 351, disposed underneath the coke-way 180, and this channel connects with a vertical pipe 352, which extends downward through the hollow shaft 248, constituting the axis of the machine. The channel 351 is flattened between the bottom of the cokeway and the gearing underneath it, so as to keep the machine as low as possible, and this flattened channel is broadened horizontally, so as preserve the same capacity as the supply-pipe 350. The lower end of this pipe projects below the crown-wheel 249 and is there provided with a swiveling coupling 353, having a laterally-extending pipe 354. This pipe is provided with a support 355, attached to the rail 20 of the car-truck, and at its outer end with a coupling 356 for connection with the fluid-main. A fluid-supply main 360 may be disposed along the track and provided with plugs, as 361, at convenient intervals, and a flexible hose 362 may serve to connect any one of the plugs with the coupling 356. The fluid-supply pipe 350 is provided with a fluid-controlling cock 370, whereof the valve-spindle is provided with a crank-arm 371, having a slot 372 at its outer end and actuated as hereinafter described.

The means herein shown for controlling the fluid-supply cock for reversing the engine, for the traction of the machine-car, for imparting longitudinal reciprocating motion to the main carriage, and for reciprocating the coke-puller carriage comprise a plurality of reciprocating slide-bars which may be actuated by a single lever having a plurality of separate angle-levers for connecting it with either one of said slide-bars. This lever, provided with a plurality of grips for the several slide-bars, will be hereinafter designated as the "multilever."

Boxes 380 and 381 are disposed at opposite ends of the coke-puller frame, these boxes being opened at their inner ends and each provided with a plurality of parallel guideways, five in number. The boxes may also be provided with slots 382 in their tops over the respective guideways. These boxes are also provided with spring-dogs, as 383 and 384, whereof biting teeth pass through the slots 382, as shown in Fig. 3, or over the inner edge of the upper plate of the box, as shown in Figs. 16, 19, and 22.

A plurality of slide-bars 400, 410, 420, 430, and 440 extend longitudinally of the coke-puller frame and are supported at their opposite ends in the guideways of said boxes, said slide-bars being shorter than the distance from

the outer end of one box to the outer end of the other box to permit a sliding movement thereof. These slide-bars are provided on their upper edges within the boxes with a plurality of notches engaged by spring-dogs, as hereinafter described. Each of these slide-bars is preferably provided with longitudinal strengthening-ribs on its under side.

The slide-bar 400 controls the fluid-supply cock and is provided with a dependent stud 401, which engages the slot 372 in the crank-arm 371, attached to the spindle of the supply-cock 370. This slide-bar is provided at one or both ends with a plurality of notches, shown as five in number—to wit, 402, 403, 404, 405, and 406—which are engaged by the spring or springs, whereby the cock is adjusted to either a full stop, a full flow, or three different intermediate positions to regulate the flow of the fluid to the engine, as shown in Fig. 14. The notches in one end of the bar and the spring-dog on one of the end boxes may be dispensed with.

The slide-bar 410 is designed to control the reversing-lever of the engine. This slide-bar is provided with a bent arm 411, having a stud 412 at its outer end, which engages the slot at the shank end of the T-shaped reversing-lever 340. This slide-bar is also provided at one or both ends with three notches, as 413, 414, and 415, which are engaged by spring-dogs, as 383 and 384, as shown in Fig. 19. These notches afford three different positions for the reversing-valve, the two extremes for the opposite motions of the engine, and the intermediate position for the full stop thereof.

The slide-bar 420 for controlling the traction mechanism for causing the machine-car to travel on the track along the tier of ovens is provided with a dependent yoke 421, which engages a clutch-sleeve 422, disposed on the driving-shaft 210 of the engine. This clutch-sleeve is splined on said shaft and provided with teeth which engage corresponding clutch-teeth on the hub of the beveled gear-wheel 220, which is loose on the driving-shaft. This slide-bar is provided with two notches 423 and 424 at its opposite ends, which are engaged by the spring-dogs 383 and 384, as shown in Fig. 22, for holding the bar in two positions, one for effecting the engagement of the traction mechanism and one in which said mechanism is disengaged or thrown out of gear, as shown in Fig. 22.

The slide-bars 430 and 440 are similar in construction to the slide-bar 420, the slide-bar 430 operating a clutch 431 for clutching and unclutching the gear-wheel 240, which drives the mechanism for longitudinally reciprocating the lower carriage, and the slide-bar 440 operating a clutch 441 for clutching and unclutching the beveled gear 290, which transmits motion to the cables for driving the coke-puller carriage.

The multilever 450 for operating the various actuating slide-bars just described is pivoted on a post 103, attached to the bracket 102, which depends from the coke-puller carriage. This lever, which is shown in Figs. 1, 2, and 3 and on a large scale, with its upper part broken off, in Fig. 6, is provided at its upper end with a cross-bar 451, carrying a plurality of handles, as 452, 453, 454, 455, and 456, and at its lower end with lateral studs 457 and 458. The lower end of the bracket 102 is provided with horizontal arms 104 and 105, and guideways 106 and 107 are disposed opposite each other on said bracket and arm. A grip-carriage 460, provided with ribs 461 and 462 on its opposite sides, is adapted to slide in said guideways and is provided on its upper surface with slotted lugs 463 and 464, which are engaged by the studs 457 and 458 at the lower end of the multilever. This grip-carriage is provided with a plurality of flanged guideways, like 465, disposed side by side, through which the various slide-bars 400, 410, 420, 430, and 440 pass. The top of the grip-carriage is provided with a series of slots just above the several slide-bars, and a transverse rod 466 extends across the carriage above said slots through lugs, as 467, interposed between the cams. A series of cams 472, 473, 474, 475, and 476 are pivoted on said transverse rod and provided with tails which swing in the top slots aforesaid and severally engage the respective slide-bars when the cams are swung in upright position (see Fig. 8) and release said slide-bars when the cams are swung into horizontal position. The cross-bar 451 of the multilever 450 is provided with a rod 459, and a series of angular or bell-crank spring finger-levers 482, 483, 484, 485, and 486 are pivoted thereon. A series of connecting-rods 492, 493, 494, 495, and 496 connect the spring finger-levers 482, 483, 484, 485, and 486 with the cams 472, 473, 474, 475, and 476. Whenever the operator wishes to actuate any of the slide-bars, he grasps the handle and finger-lever of the multilever, which is connected with the cam disposed over that particular slide-bar, and thereby operates the mechanism controlled by the latter. For instance, the grasping of the finger-lever 483 causes the cam 473 to engage the slide-bar 410 and clamp it tightly against the flanges of the guideway 465, as shown in Fig. 8, and while the slide-bar is so clamped a swing of the multilever 450 in either direction will cause the carriage 460 to move in the opposite direction and carry the slide-bar with it. Thus a movement of the slide-bar 410 toward the right in Fig. 4 will swing the reversing-lever 340 into either of the dotted-line positions there shown.

Operation: The operation of the machine will now be described. The machine-car is brought into position opposite the oven, to be drawn by means of a separate locomotive or by its own traction mechanism. In the latter

case the flexible pipe-section 362, of sufficient length to reach from one oven to another, is connected at one end to the air-main 360 and at the other end to the coupling 356. Then the multilever 450 is grasped by the handle 452 and finger-lever 482 and the cam 472 made to grip the slide-bar 400, and then by a slight swing of the multilever said slide-bar is shifted and the fluid-supply cock 370 is opened. Then the multilever 450 is actuated by the handle 454 and finger-lever 484, and the cam 474 made to grip and move the slide-bar 420, whereby the clutch-sleeve 422 is shifted and the traction mechanism is thrown into gear and the machine made to travel to the required point. Then the operator grasps the hand-wheel 271 and by it turns the swiveling base 60 a quarter-rotation, bringing the cokeway at right angles to the machine-car and into position to receive the coke from the oven and deliver it into the coke-car 3, as shown in Fig. 1. Another manipulation of the multilever 450 by means of its handle 456 and finger-lever 486 shifts the slide-bar 440 and throws the clutch 441 into connection with the gear 290, whereby motion is imparted to the endless cables, the engine then moving in forward direction and causing the upper runs of said cables to move toward the oven. Then the grip-lever 320 on the coke-puller carriage 110 is actuated to bring the cable-grip mechanism mounted on said carriage into gripping connection with said cables. The coke-puller carriage is thus made to travel toward the ovens, whereby the coke-puller 160 or coke-loosener 150 is thrust through the door thereof. The coke-loosener 150 is preferably first applied to the coke-puller bar 130, and as the coke-puller carriage moves toward the oven this coke-loosener slides along the bottom thereof underneath the caked coke within the oven and has a wedge-like action, lifting a strip of coke equal to the width of the coke-loosener and breaking it from the mass of coke on either side thereof, as shown in Fig. 23. The coke-puller carriage is caused to move toward the oven until the coke-loosener enters to a point near the back wall thereof, as indicated in Fig. 3. Then the operator operates the multilever 450 by its handle 453 and finger-lever 483, whereby the slide-bar 410 is moved and the reversing-valve of the engine is shifted, the motion of the cables 288 and 289 reversed, and the coke-puller carriage caused to travel rearward, withdrawing the coke-loosener, as indicated in Fig. 24. Then the multilever is actuated by its handle 455 and finger 485 to shift the clutch 431 into connection with the gear-wheel 240, whereby the main platform 50 may be shifted first in one direction and then in the other on the coke-car, as indicated in dotted lines in Fig. 3, and the coke at both sides of the oven loosened by inward thrusts of the coke-loosener, as before described. Then the coke-loosener is removed from the coke-puller bar 130 and a duck-bill or other coke-puller 160 is applied thereto. Then the engine is caused to move forward, and the coke-puller carriage is again made to travel toward the oven and the coke-puller thrust thereinto a distance sufficient to make a first drawing of the coke. Then by means of the lever 175 a pickax or clawing motion may be imparted to the coke-puller, and by the lever 140, assisted by the angular finger-lever 142 or 143, a lateral swing may be imparted thereto in either direction. Then the reversing-lever is again actuated and the engine made to move backward, whereby the coke-puller carriage withdraws the coke-puller and the coke in front thereof, the latter sliding to the door and falling into the cokeway 180. Then another thrust of the coke-puller is made into the oven, two or more thrusts being required to take out the coke in a straight line through the diameter of the oven. Then the main carriage is oscillated first in one direction and then in the other on the coke-car and moved longitudinally thereon, as indicated in dotted lines in Fig. 3, and the coke at the sides of the oven is withdrawn by inward and outward thrusts of the coke-puller through the reciprocation of the coke-puller carriage. The lateral strokes of the coke-puller may also be effected in a measure by swiveling the table 110 by means of the hand-wheel 116. The coke-puller may thus be made to simulate the action of hand coke-pulling, and the coke may be withdrawn without breakage of the sticks thereof.

I claim as my invention—

1. In a coke-drawing machine, the combination of a track, a coke-puller carriage adapted to travel on said track toward and from a coke-oven, a coke-puller supported on said carriage and adapted to travel therewith to effect the coke-pulling operations, means for reciprocating said coke-puller carriage, and mechanical means on said carriage and under the control of the operator for otherwise manipulating said coke-puller.

2. In a coke-drawing machine, the combination of a car, a base supported thereon and provided with a track, a coke-puller carriage adapted to travel on said track toward and from a coke-oven, a coke-puller supported on said carriage and adapted to travel therewith to effect the coke-pulling operations, means for reciprocating said coke-puller carriage, and mechanical means on said carriage and under the control of the operator for otherwise manipulating said coke-puller.

3. In a coke-drawing machine, the combination of a car, a swiveling base supported thereon and provided with a track, a coke-puller carriage adapted to travel on said track toward and from a coke-oven, a coke-puller supported on said carriage and adapted to travel therewith to effect the coke-pulling operations, means for reciprocating said coke-puller carriage,

and mechanical means for otherwise manipulating said coke-puller.

4. In a coke-drawing machine, the combination of a track, a coke-puller carriage adapted to travel on said track toward and from a coke-oven, a coke-puller supported on said carriage and adapted to travel therewith to effect the coke-pulling operations, means for reciprocating said coke-puller carriage, and mechanical means on said carriage and under the control of the operator for vertically oscillating said coke-puller.

5. In a coke-drawing machine, the combination of a track, a coke-puller carriage adapted to travel on said track toward and from a coke-oven, a coke-puller supported on said carriage and adapted to travel therewith to effect the coke-pulling operations, means for reciprocating said coke-puller carriage, and means for laterally oscillating said coke-puller.

6. In a coke-drawing machine, the combination of a track, a coke-puller carriage adapted to travel on said track toward and from a coke-oven, a coke-puller supported on said carriage and adapted to travel therewith to effect the coke-pulling operations, means for reciprocating said coke-puller carriage, and means for vertically and laterally oscillating said coke-puller.

7. The combination of a car, a swiveling base mounted thereon and provided with a track, a coke-puller carriage adapted to travel on said track toward and from the oven, and comprising a traveling platform, and a swiveling table mounted thereon, a coke-puller supported on said swiveling table and adapted to travel therewith, means for reciprocating said coke-puller carriage, and mechanical means for manipulating said coke-puller.

8. The combination of a car, a swiveling base supported thereon and provided with a track, a coke-puller carriage adapted to travel on said track toward and from the oven, and comprising a platform having a rear extension and a swiveling table mounted on said platform, a coke-puller supported on said swiveling table, means for reciprocating said coke-puller carriage, and mechanical means for manipulating said coke-puller.

9. The combination of a swiveling base, a track mounted thereon, a cable mechanism also supported on said base, means for operating the cable of said mechanism, a coke-puller carriage adapted to travel on said track toward and from the coke-oven, a cable-grip mechanism mounted on said carriage, and a coke-puller mounted on said carriage.

10. The combination of a swiveling base provided with a track, a coke-puller carriage adapted to reciprocate on said track, a traction-cable supported on said swiveling base, and cable-grip mechanism attached to said coke-puller carriage for gripping said cable.

11. The combination of a swiveling base provided with a track, a coke-puller carriage adapted to reciprocate on said track, a traction-cable supported on said swiveling base, cable-grip mechanism attached to said coke-puller carriage for gripping said cable, and automatic stop mechanism for releasing said gripping mechanism.

12. The combination of a swiveling base, a coke-drawing mechanism supported on said base, a cokeway also supported on said base and adapted to receive the coke drawn from the oven, and means for pushing said coke through said cokeway to the point of discharge.

13. The combination of a traveling base, a frame mounted thereon and provided with a track, a coke-puller carriage adapted to reciprocate on said track and comprising a swiveling table, a coke-puller, means mounted on said swiveling table for supporting said coke-puller, and mechanical means for oscillating said coke-puller.

14. The combination of a traveling swiveling base, a frame mounted thereon and provided with a track, a coke-puller carriage adapted to reciprocate on said track and comprising a swiveling table, a coke-puller, means on said swiveling table for supporting said coke-puller, and mechanical means for oscillating said coke-puller.

15. The combination of a traveling swiveling base, a frame mounted thereon and provided with a track, a coke-puller carriage adapted to reciprocate on said track and comprising a swiveling table, a coke-puller, means on said swiveling table for supporting said coke-puller, and means for vertically oscillating said coke-puller.

16. The combination of a traveling swiveling base, a frame mounted thereon and provided with a track, a coke-puller carriage adapted to reciprocate on said track, and comprising a swiveling table, a coke-puller, means on said swiveling table for supporting said coke-puller, and means for laterally oscillating said coke-puller.

17. The combination of a traveling swiveling base, a frame mounted thereon and provided with a track, a coke-puller carriage adapted to reciprocate on said track and comprising a swiveling table, a coke-puller, means on said swiveling table for supporting said coke-puller, and means for vertically and laterally oscillating said coke-puller.

18. In a coke-drawing machine, the combination of a cokeway, a coke-puller carriage traveling over said cokeway and provided with means for drawing coke thereinto, and a coke-pusher mounted on said carriage and operating to push the coke through said cokeway.

19. In a coke-drawing machine, the combination of a cokeway provided with a track, and a coke-puller carriage adapted to travel there-

on and provided with means for drawing coke into said cokeway, and with plows for clearing said track of coke.

20. In a coke-drawing machine, the combination of a cokeway, a coke-puller carriage adapted to travel over said way and provided with means for drawing coke into said cokeway, and a coke-pusher having a swinging connection with said carriage.

21. In a coke-drawing machine, the combination of a cokeway, a coke-puller carriage adapted to travel over said way and provided with means for drawing coke into said cokeway, a coke-pusher hinged to said carriage and adapted to swing in an approximately vertical position on the rear movement of the carriage for pushing the coke through the cokeway and to swing upward and ride freely over the coke on the forward movement of the carriage.

22. In a coke-drawing machine, the combination of a cokeway, a coke-puller carriage adapted to travel over said way and provided with means for drawing coke into said cokeway, a coke-pusher hinged at one end to said carriage and adapted to swing into operative position on the backward movement thereof and into inoperative position on the forward movement of the carriage.

23. In a coke-drawing machine, the combination of a cokeway, a coke-puller carriage adapted to travel over said way and provided with means for drawing coke into said cokeway, and a coke-pusher hinged to the front end of said carriage and adapted to swing into operative position on the backward movement of the carriage and into inoperative position on the forward movement thereof.

24. In a coke-drawing machine, the combination of a cokeway, a coke-puller carriage adapted to travel over said cokeway and provided with means for drawing coke into said cokeway, and a fingered coke-pusher having a swinging connection with said carriage.

25. In a coke-drawing machine, the combination of a cokeway, a coke-puller carriage adapted to travel over said way and provided with means for drawing coke into said cokeway, and a coke-pusher pivoted to said carriage and comprising a series of independently-swinging fingers.

26. In a coke-drawing machine, the combination of a cokeway in the form of a trough provided with an inclined front end, a coke-puller carriage adapted to travel over said cokeway and provided with means for drawing coke into said cokeway, and means for pushing said coke through said cokeway to the point of delivery.

27. In a coke-drawing machine, the combination of a cokeway provided with wings on its opposite sides at its opposite ends, a coke-puller carriage adapted to travel over said cokeway and provided with means for drawing coke thereinto, and means for causing the coke to travel through the cokeway to the point of delivery.

28. In a coke-drawing machine, the combination of a vertically-oscillating coke-puller socket, a support in which said coke-puller socket is pivoted, a coke-puller bar supported in said coke-puller socket, and ratchet mechanism for axially turning said bar in said socket.

29. In a coke-drawing machine, the combination of a vertically-oscillating coke-puller socket, a support in which said coke-puller socket is pivoted, a coke-puller bar supported in said coke-puller socket, and a duplex ratchet mechanism for turning said coke-puller bar in opposite directions.

30. In a coke-drawing machine, the combination of a vertically-oscillating coke-puller socket, a support in which said coke-puller socket is pivoted, a coke-puller bar supported in said coke-puller socket, means for axially adjusting said bar, and an indicator for indicating the angle of inclination of the coke-puller within the oven.

31. In a coke-drawing machine, the combination of a vertically-oscillating socket, supports on which said socket is pivoted, a coke-puller bar supported at one end in said socket and provided at its other end with a coke-puller, means for axially oscillating said coke-puller bar to adjust the coke-puller at different angles, and means for locking said coke-puller bar in different axially-adjusted positions.

32. In a coke-drawing machine, the combination of a coke-puller bar pivoted to oscillate in a vertical plane, a crank pivoted adjacent to the pivot of said coke-puller bar and having a pivotal connection therewith, and a hand-lever on the shaft of said crank for oscillating said crank to swing said coke-puller bar vertically.

33. In a coke-drawing machine, the combination of a carriage adapted to reciprocate toward and from a coke-oven, a socket pivoted on said carriage, a coke-puller bar supported near one end in said socket and provided with a coke-puller at its opposite end, a crank pivoted adjacent to the pivot of said coke-puller bar and having a pivotal connection with said socket, and means for swinging said crank to oscillate said coke-puller bar.

34. In a coke-drawing machine, the combination of a carriage adapted to reciprocate toward and from a coke-oven, a socket pivoted on said carriage to oscillate vertically, a coke-puller bar supported at one end in said socket and provided at its other end with a coke-puller, a yoke having trunnions pivoted in front of the pivot of said socket and provided with a crank-arm having a pivotal connection with the front portion of said socket, and a lever connected with one of said trunnions for oscillating said yoke.

35. In a coke-drawing machine, the combination of a coke-puller carriage adapted to reciprocate toward and from a coke-oven, a socket pivoted on said carriage to oscillate vertically and having a longitudinal guideway, a crank pivoted adjacent to the pivot of said socket and provided with a crank-pin adapted to engage the longitudinal guideway thereof, means for oscillating said crank, and a coke-puller bar supported at one end in said socket and provided at the other end with a coke-puller.

36. In a coke-drawing machine, the combination of a coke-puller carriage adapted to reciprocate toward and from a coke-oven, a socket pivoted on said carriage to oscillate vertically and having a longitudinal guideway, a crank pivoted adjacent to the pivot of said socket and provided with a crank-pin adapted to engage the longitudinal guideway thereof, a claw-lever for oscillating said crank, and a coke-puller bar supported at one end in said socket and provided at the other end with a coke-puller.

37. In a coke-drawing machine, the combination of a coke-puller carriage adapted to reciprocate toward and from a coke-oven, a socket pivoted on said carriage to oscillate vertically and having a longitudinal guideway, a crank pivoted adjacent to the pivot of said socket and provided with a crank-pin adapted to engage the longitudinal guideway thereof, an adjustable clawing lever for oscillating said crank, means for holding said lever in adjusted position, and a coke-puller bar supported at one end in said socket and provided at the other end with a coke-puller.

38. In a coke-drawing machine, the combination of a car, a longitudinal shaft mounted thereon, gearing connecting said shaft with one of the car-axles, a sliding pinion splined on said shaft, a carriage adapted to travel longitudinally on said car, an engine mounted on said carriage, a vertical shaft mounted on said carriage and provided with a beveled gear adapted to mesh with said sliding splined pinion on said longitudinal shaft for operating the latter in any position of the carriage on the car, and motion-transmitting mechanism connecting said vertical shaft with the engine.

39. In a coke-drawing machine, the combination of a car, a longitudinal shaft mounted thereon, gearing connecting said shaft with one of the car-axles, a sliding pinion splined on said shaft, a carriage adapted to travel longitudinally on said car, means for causing said pinion to travel with the carriage, an engine mounted on said carriage, a vertical shaft mounted on said carriage and provided with a beveled gear adapted to mesh with said sliding splined pinion on said longitudinal shaft for operating the latter in any position of the carriage on the car, and motion-transmitting mechanism connecting said vertical shaft with the engine.

40. In a coke-drawing machine, the combination of a car, a longitudinal shaft mounted thereon, gearing connecting said shaft with one of the car-axles, a sliding pinion splined on said shaft, a carriage adapted to travel longitudinally on said car, an engine mounted on said carriage, a vertical shaft mounted on said carriage and provided with a beveled gear adapted to mesh with said sliding splined pinion on said longitudinal shaft for operating the latter in any position of the carriage on the car, a yoke suspended on the beveled gear-wheel and provided at one end with a dependent collar which engages the grooved end of the sliding pinion for causing it to move in unison with the carriage.

41. In a coke-drawing machine, the combination of a car, a longitudinal shaft mounted thereon, gearing connecting said shaft with one of the car-axles, a sliding pinion splined on said shaft, a carriage adapted to travel longitudinally on said car, an engine mounted on said carriage, a vertical shaft mounted on said carriage and provided with a beveled gear adapted to mesh with said sliding splined pinion on said longitudinal shaft for operating the latter in any position of the carriage on the car, a yoke suspended on the beveled gear-wheel and provided at one end with a dependent collar which engages the grooved end of the sliding pinion for causing it to move in unison with the carriage, and at the other end with a dependent guide which slides on said longitudinal shaft.

42. In a coke-drawing machine, the combination of a car, a swiveling base supported thereon, a motor mounted on said swiveling base, a plurality of mechanisms operated by said motor including a hollow shaft extending through the axis of said swiveling base, and a fluid-supply pipe passing through said hollow shaft and connecting with said motor.

43. In a coke-drawing machine, the combination of a car, a longitudinal rack-bar supported thereon, a carriage adapted to reciprocate on said car, a vertical shaft supported in said carriage and provided at its lower end with a gear-wheel adapted to mesh with said rack and at its upper end with a worm-wheel, a worm-shaft supported on said carriage and provided with a worm adapted to mesh with said worm-wheel, and means for actuating said worm-shaft.

44. The combination of a car provided with a longitudinal rack, a carriage adapted to reciprocate on said car and comprising a traveling platform and a swiveling base thereon, a vertical shaft disposed at the axis of said swiveling base and provided at its lower end with a gear-wheel meshing with said rack and at its upper end with a worm-wheel, a worm-shaft, and means for driving said worm-shaft.

45. The combination of a car provided with a longitudinal rack, a carriage adapted to reciprocate on said car and comprising a traveling platform and a swiveling base thereon, a vertical shaft disposed at the axis of said swiveling base and provided at its lower end with a gear-wheel meshing with said rack and at its upper end with a worm-wheel, a worm-shaft, gearing for driving said worm-shaft, and means for switching said gearing into and out of connection with the driving-shaft.

46. The combination of a traveling platform provided with an arc-shaped rack, a swiveling base mounted on said platform, a shaft supported on said platform and provided at its lower end with a pinion engaging said arc-shaped rack and at its upper end with a pinion, sprocket-wheels supported on said swiveling base, a sprocket-chain supported on said sprocket-wheels and provided with lateral gear-teeth engaging the pinion at the upper end of said shaft, a reciprocating carriage on said base, and a sprocket-wheel mounted on said carriage and traveling therewith and engaging said sprocket-chain for swiveling the base at any position of the carriage thereon.

47. The combination of a traveling platform provided with an arc-shaped rack, a swiveling base mounted on said platform, a shaft supported on said platform and provided at its lower end with a pinion engaging said arc-shaped rack and at its upper end with a pinion, sprocket-wheels supported on said swiveling base, a sprocket-chain supported on said sprocket-wheels and provided with lateral gear-teeth engaging the pinion at the upper end of said shaft, a reciprocating carriage on said base, a sprocket-wheel mounted on said carriage and traveling therewith and engaging said sprocket-chain for swiveling the base at any position of the carriage thereon, and a guide for holding the chain in gear with said upper pinion.

48. The combination of a car, a swiveling base mounted thereon and provided with a track, a carriage adapted to reciprocate on said track, means for turning said base, and actuating mechanism for said turning mechanism mounted on said carriage and adapted to operate in any position thereof.

49. In a coke-drawing machine, the combination of a traveling base provided with a track, a carriage adapted to reciprocate on said track, transverse shafts supported at different heights on said traveling base, pulleys on said shafts, an endless cable passing over said pulleys, a cable-guide disposed adjacent to one of said pulleys and operative to hold one run of said cable in horizontal position, and a cable-grip disposed on said carriage and adapted to engage said run of the cable at any position of the carriage.

50. In a coke-drawing machine, the combination of a traveling base provided with a track, a carriage adapted to reciprocate on said track, transverse shafts supported on said base, pulleys disposed on said shafts, an endless cable supported on said pulleys, a cable-guide disposed adjacent to one of said pulleys and operative to hold one run of the cable in horizontal position, a cable-grip disposed on said carriage and adapted to engage said run of the cable at any position of the carriage, an actuating sprocket-wheel on one of said shafts, driving-gear mounted on said base, and a sprocket-chain connecting said actuating sprocket-wheel with said driving-gear.

51. In a coke-drawing machine, the combination of a supporting-base provided with a track, a carriage adapted to reciprocate on said track, transverse shafts supported on said base, pulleys disposed on said shafts, an endless cable supported on said pulleys, an actuating sprocket-wheel on one of said shafts, driving-gear mounted on said base, a sprocket-chain connecting said actuating sprocket-wheel with said driving-gear, a cable-guide disposed adjacent to one of said pulleys and operative to hold one run of the cable in horizontal position, a cable-grip disposed on said carriage and adapted to engage said run of the cable at any position of the carriage, and a boxing for protecting said grip mechanism from the coke-dust.

52. In a coke-drawing machine, the combination of a traveling base provided with a track, a coke-puller carriage adapted to reciprocate on said track, a plurality of mechanisms supported on said base, a plurality of actuating devices therefor, a plurality of slide-bars for controlling said actuating devices, a bracket attached to said reciprocating carriage and provided with guideways, a multilever pivoted to said bracket, a grip-carriage supported in said guideways and engaged by said multilever, a plurality of slide-bars having suitable supports and passing through said grip-carriage, and a plurality of grippers mounted on said grip-carriage and individually actuated by said multilever.

53. In a coke-drawing machine, the combination of a car, a base supported thereon and provided with a track, a motor mounted on said base, a coke-puller carriage adapted to travel on said track toward and from a coke-oven, and provided with a platform for the operator, a coke-puller supported on said carriage and adapted to travel therewith to effect the coke-pulling operations, means connected with said motor for reciprocating said coke-puller carriage, mechanical means for otherwise manipulating said coke-puller, and actuating-levers mounted on the platform of the coke-puller carriage for operating said means.

54. The combination of a traveling base, a track mounted thereon, a cable mechanism also supported on said base, means for operating the cable of said mechanism, a coke-puller carriage adapted to travel on said track toward

and from the coke-oven, a cable-grip mechanism mounted on said carriage, and a coke-puller mounted on said carriage.

55. The combination of a traveling swiveling base, a track mounted thereon, a cable mechanism also supported on said base, means for operating the cable of said mechanism, a coke-puller carriage adapted to travel on said track toward and from the coke-oven, a cable-grip mechanism mounted on said carriage, and a coke-puller mounted on said carriage.

56. The combination of a traveling base provided with a track, a coke-puller carriage adapted to reciprocate on said track, a traction-cable supported on said base, and cable-grip mechanism attached to said coke-puller carriage for gripping said cable.

57. The combination of a traveling swiveling base provided with a track, a coke-puller carriage adapted to reciprocate on said track, a traction-cable supported on said base, and cable-grip mechanism attached to said coke-puller carriage for gripping said cable.

58. The combination of a traveling base provided with a track, a coke-puller carriage adapted to reciprocate on said track, a traction-cable supported on said base, cable-grip mechanism attached to said coke-puller carriage for gripping said cable, and automatic stop mechanism for releasing said gripping mechanism.

59. The combination of a traveling swiveling base provided with a track, a coke-puller carriage adapted to reciprocate on said track, a traction-cable supported on said base, cable-grip mechanism attached to said coke-puller carriage for gripping said cable, and automatic stop mechanism for releasing said gripping mechanism.

60. The combination of a traveling base, a coke-drawing mechanism supported on said base, a cokeway also supported on said base and adapted to receive the coke drawn from the oven, and a moving coke-pusher reciprocating over said cokeway and operative to push said coke through said cokeway to the point of discharge.

61. The combination of a traveling swiveling base, a coke-drawing mechanism supported on said base, a cokeway also supported on said base and adapted to receive the coke drawn from the oven, and means for pushing said coke through said cokeway to the point of discharge.

ANDREW JACKSON DOSS.

Witnesses:
L. B. CRAWFORD,
T. T. SMITH.