No. 731,913. PATENTED JUNE 23, 1903.

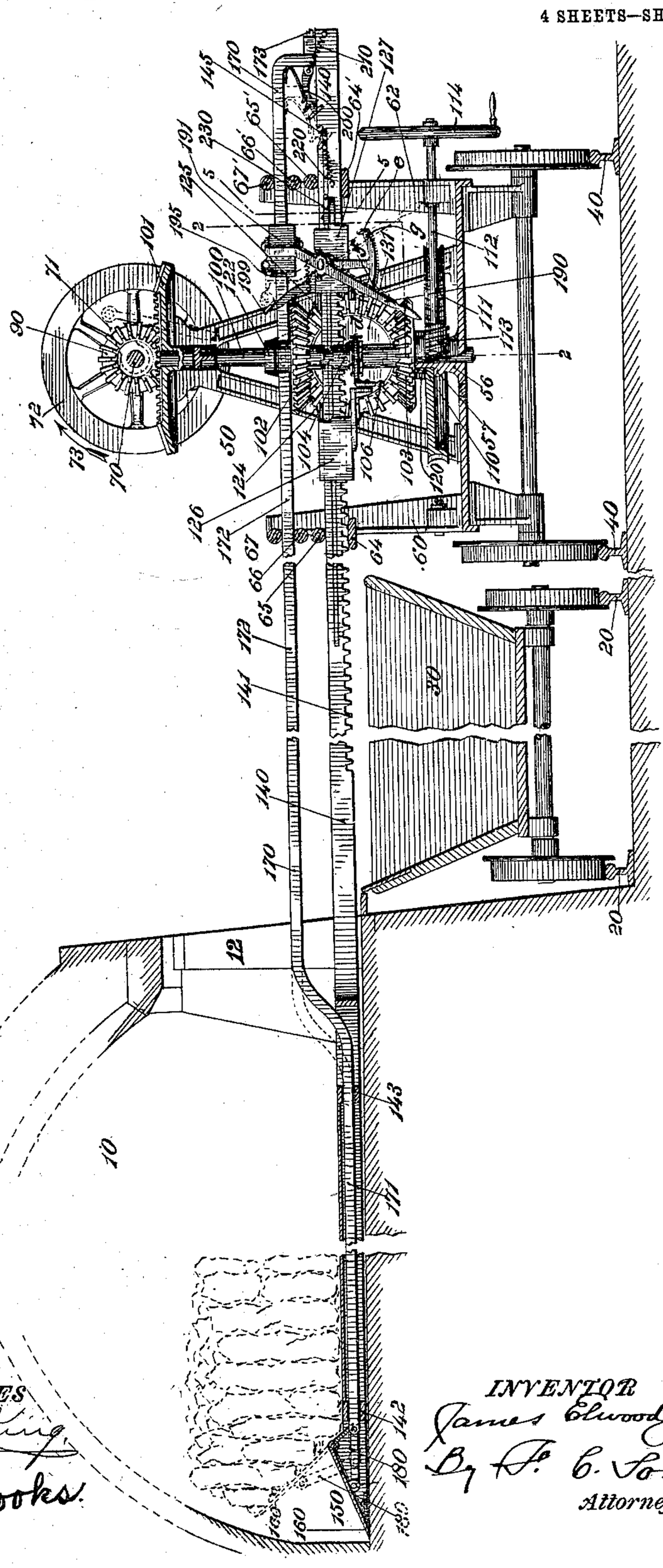
J. E. JONES.

MACHINE FOR DISCHARGING COKE OVENS.

APPLICATION FILED APR. 30, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.



WITNESSES
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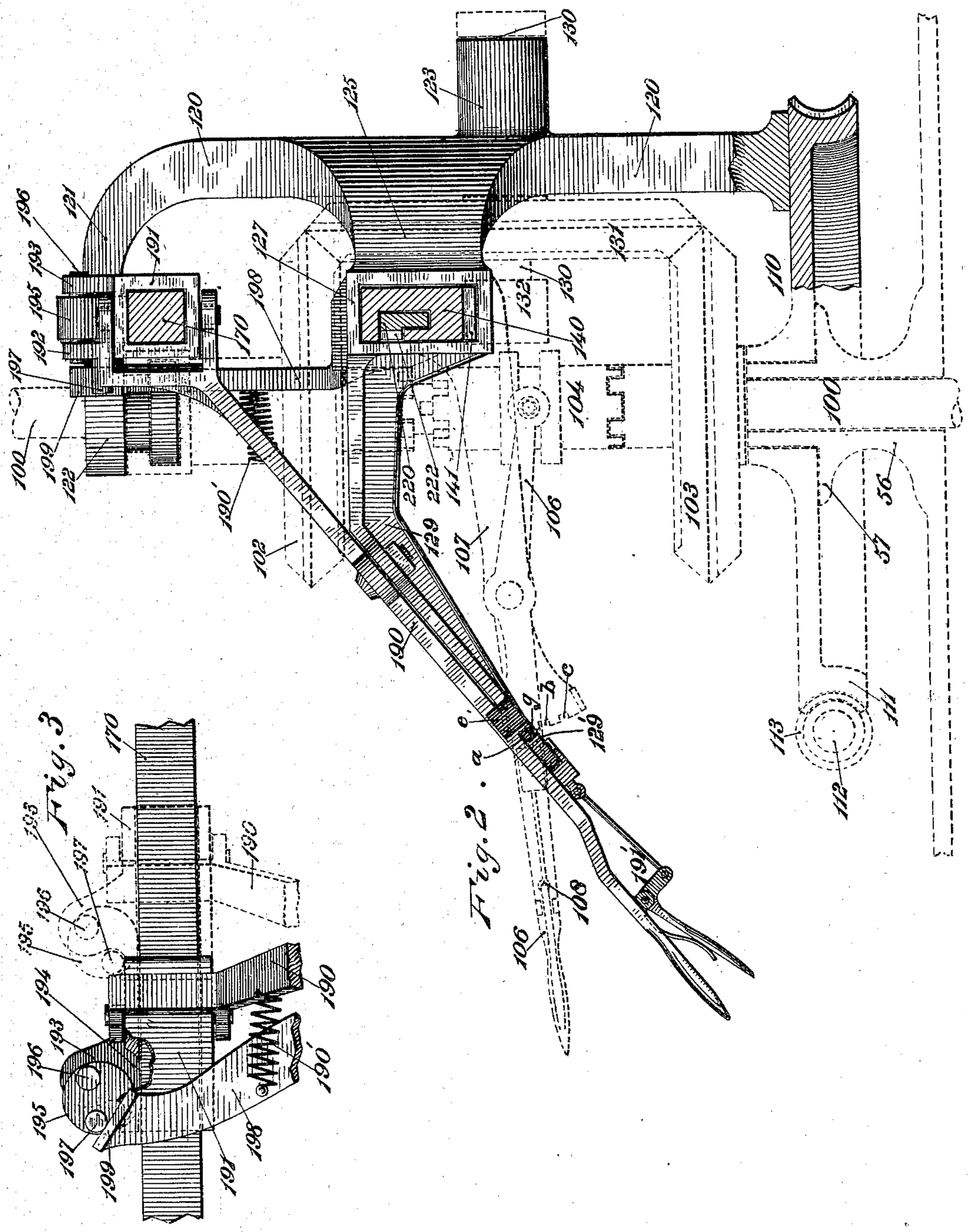

Fig. 2.

Fig. 3.

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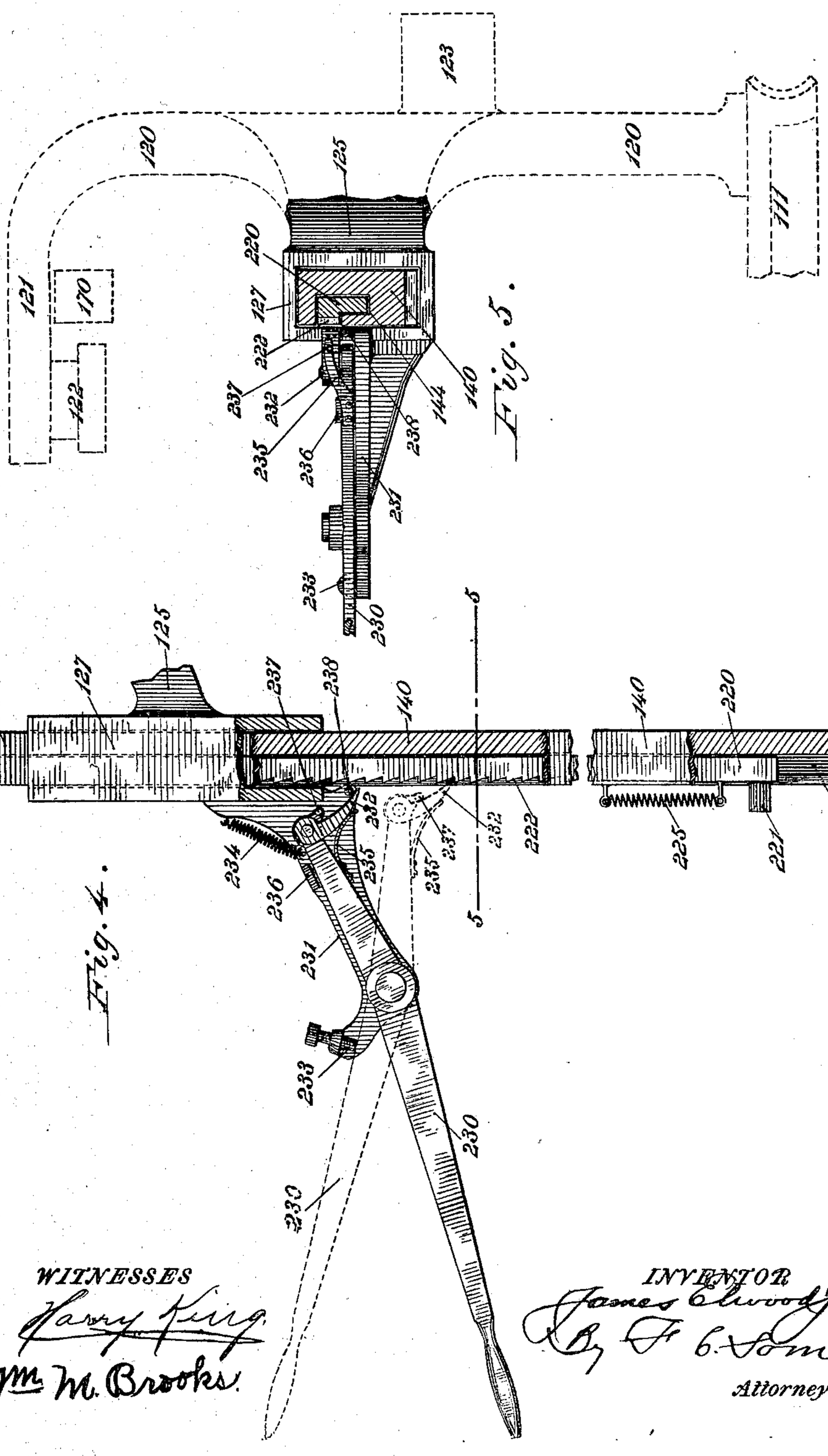

Fig. 5.

Fig. 4.

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NO MODEL. 4 SHEETS—SHEET 4.

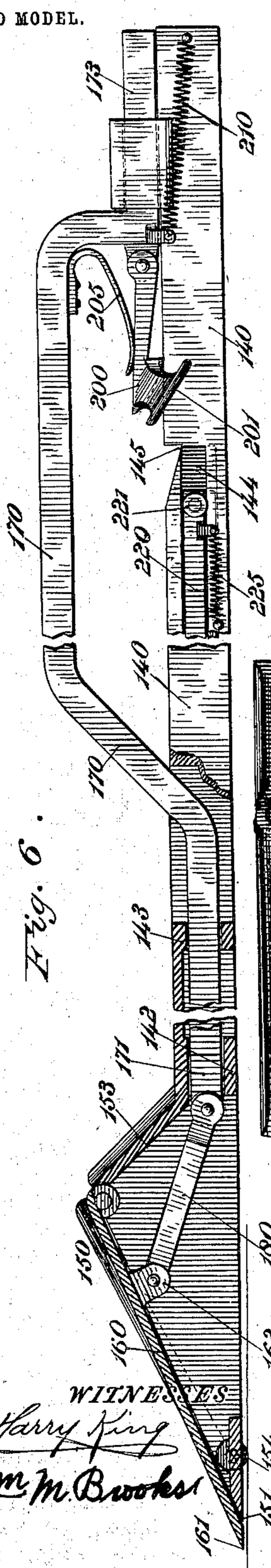

Fig. 6.

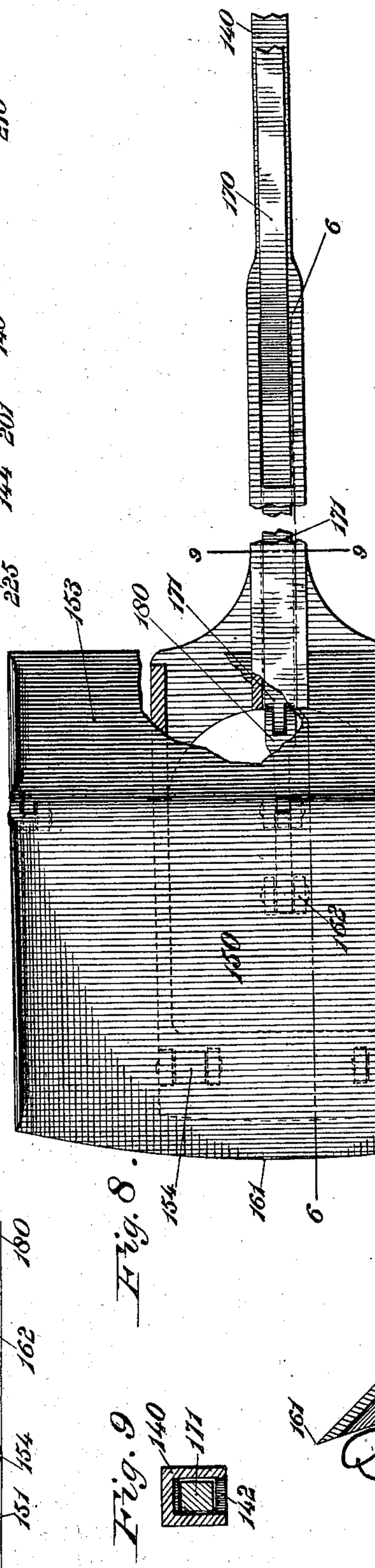

Fig. 8.

Fig. 7.

Fig. 9

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No. 731,913. Patented June 23, 1903.

UNITED STATES PATENT OFFICE.

JAMES ELLWOOD JONES, OF SWITCHBACK, WEST VIRGINIA.

MACHINE FOR DISCHARGING COKE-OVENS.

SPECIFICATION forming part of Letters Patent No. 731,913, dated June 23, 1903.

Application filed April 30, 1903. Serial No. 155,072. (No model.)

To all whom it may concern:

Be it known that I, JAMES ELLWOOD JONES, 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 Machines for Discharging Coke-Ovens, of which the following is a specification.

This invention relates to a coke-puller designed to be operated by 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 coke 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 invention relates more especially to a coke-puller having an underworking or wedge-shaped scraper operating on the instroke into the oven to loosen the coke for withdrawal and provided with adjustable means operative on the outstroke for grasping or holding loosened coke disposed over and above the scraper whereby a thorough discharge of the oven may be obtained.

The object of the invention is to provide simple and effective means for operating and controlling the grasping or holding device, which is utilized on the outstroke for removing the mass of coke loosened on the instroke.

Figure 1 of the accompanying drawings represents a side elevation, partly in section, of one embodiment of this mechanical coke-puller in connection with a coke-oven, a coke-car for receiving the coke pulled from the oven, and a machine-car on which the puller is mounted, the oven and cars being in section and parts being broken out. Fig. 2 represents, on an enlarged scale, a vertical section on line 2 2 of Fig. 1. Fig. 3 represents, on an enlarged scale, the means for clamping and releasing the auxiliary bar which operates the coke-grasping device. Fig. 4 represents a plan view, also on an enlarged scale, of the tripping mechanism for releasing the auxiliary bar and permitting it to be retracted independently of the rack-bar which operates the scraper. Fig. 5 represents a vertical transverse section of said bars and tripping mechanism on line 5 5 of Fig. 4. Fig. 6 represents in part a longitudinal section and in part a side elevation of the coke-puller on line 6 6 of Fig. 8, the swinging plate or coke-grasping device being in closed position. Fig. 7 represents the same parts as Fig. 6, the swinging plate being in open position. Fig. 8 represents a plan of the scraper with parts broken out. Fig. 9 represents a transverse section on line 9 9 of Fig. 8 of the front end of the bar for operating the scraper and the auxiliary bar inclosed therein to protect it from the coke within the oven.

The same reference characters indicate the same parts in all of the figures.

This coke-pulling apparatus may be used for discharging various forms of coke-ovens.

The drawings represent fragments of a beehive coke-oven 10, provided, as usual, with a top opening, which serves for a feed and blast opening, and with a lateral discharge-opening 12. These openings are closed and sealed in the usual manner during the coking operation or a part thereof. A number of such coke-ovens are arranged side by side, and a railway-track 20 is disposed in front thereof, on which travel the coke-cars 30 for receiving and conveying away the coke drawn from the oven. Any suitable means may be employed for disposing of the coke withdrawn from the ovens. A track 40 is disposed outside the track 20 parallel therewith, and a machine-car 50, on which the discharging apparatus is mounted, travels on said track 40.

A suitable frame for supporting the mechanism of the coke-puller proper is mounted on the car 50. The platform of the machine-car is provided with standards, as 60, on one side and with standards, as 62, on the other side thereof. The standards are connected by a longitudinal rail 64 and elongated anti-friction-rollers 65, 66, and 67, disposed parallel with each other in a horizontal plane about midway of the height of the main frame, and these rails and rollers form a guideway for the coke-puller, as hereinafter described. Corresponding rails and rollers

64′ 65′ and 66′ and 67′ connect the standards at the other side of the car and form a guide for said coke-puller.

A horizontal driving-shaft 70 is supported in bearings of the frame. This shaft is provided with a driving-crank 71 and a fly-wheel 72. Any suitable engine may be employed for imparting motion to the driving-shaft. This engine may be provided with any means usually employed for stopping, starting, and reversing.

A vertical shaft 100 is supported at its upper end in a cross-bar of the frame and turns near its lower end in a bearing 56, fixed to the platform of the car. This shaft is shown as broken off below said platform; but it may be connected by suitable clutch-gearing with one of the car-axles and utilized to drive the car along the track. The shaft-bearing 56 is provided with a shoulder 57, which serves as a stop-bearing. A beveled pinion 90 is disposed on and adapted to rotate with the driving-shaft. A beveled gear-wheel 101 is fixed on the upper end of the vertical shaft 100 and meshes with the bevel-pinion 90 on the driving-shaft 70. This vertical shaft is provided with two loose beveled pinions 102 and 103, disposed one above the other in reverse relation to each other, the sleeves or hubs thereof being provided with clutch-faces. A sliding clutch 104 is splined to the vertical shaft between said pinions and adapted to lock the said pinions respectively to the shaft. A clutch-lever 106 actuates the clutch 104 and shifts into engagement with either pinion for driving the shaft 100 in either direction. This clutch-lever is pivoted on an arm 107, attached to the guide 127. The outer end of the arm is provided with three locking-recesses *a b c*, and the lever is provided with a latch 108, adapted to engage said recesses. When the latch is in recess *a*, the clutch 104 is held in gear with the pinion 103, as shown in Fig. 2. When in recess *c*, said clutch is held in engagement with the pinion 102, and when in the notch *b* the clutch is disengaged from both pinions.

A swiveling carriage is mounted on the machine-car for carrying the coke-puller, which is thrust into and retracted from the oven in pulling the coke therefrom. This swiveling carriage may be of any suitable construction. As herein shown, it comprises a rotary circular base 110, disposed on the step-bearing 57 around the shaft 100, and a standard 120, mounted on said base. The rotary base is provided with a toothed flange 111, forming a worm-wheel. A shaft 112 has a worm 113, engaging said worm-wheel, and a crank-wheel 114, whereby the operator may turn the carriage as desired. The standard 120 is provided at its upper end with a horizontal arm 121, provided with an eye 122, through which the shaft 100 passes. This standard is also provided with a horizontal shaft-bearing 123 and with two arms 124 and 125. These arms are provided with horizontal guideways 126 and 127, disposed in alinement and serving to support the main actuating-bar of the coke-puller, as hereinafter described. A stub-shaft 130, disposed in the bearing 123, is provided with a beveled wheel 131, which meshes with both the bevel-pinions 102 and 103 and with a pinion 132.

A coke-puller proper comprising a scraper adapted for loosening a portion of the caked coke on the instroke and having an adjustable coke grasper or holder for grasping or holding the loosened coke over and above the scraper on the outstroke is mounted on and actuated from the swiveling carriage. This coke-puller may be constructed in any suitable form which adapts it for performing this double function. In the form of embodiment shown in the drawings it comprises a scraper-bar 140, a beveled scraper 150 at the outer end thereof, an adjustable coke-grasper in the form of a swinging plate 160, a grasper-bar 170, a flexible connection 180 between the grasper-bar and the swinging plate, and means for actuating said bars. The body of the scraper 150, which may be solid or of skeleton construction, is in the form of an edge attached to the bar 140 and beveled downward from its rear face 153 to its thin front edge 151. The front edge is preferably arc-shaped to conform to the curvature of the oven-wall, and the rear face is preferably straight and at an abrupt angle to the inclined upper face. This body is preferably provided on its under side with antifriction-rolls 154 and 155, which travel on the oven-bottom. The scraper-bar 140 is supported in the guideways 126 and 127 of the swiveling carriage and also in the elongated stationary guideways at opposite sides of the machine-car, which latter permit the bar to swing horizontally to different angles as the supporting-carriage swivels. The inner portion of this bar is provided with rack-teeth 141, which engage the pinion 132, whereby said bar is reciprocated to thrust and retract the scraper. This bar is preferably somewhat enlarged and hollow along its front portion and provided therein with guides 142 and 143, and along its rear portion it is provided with a longitudinal channel or slot 144 and near its outer end with a notch or stop 145.

The coke-grasper is shown in this instance in the form of a swinging plate 160, hinged to the upper angle of the scraper 150 and extending in a transverse direction to the bar 140. This plate has a beveled outer edge 161, adapted to the bottom of the oven, and a lug 162 on its under side. The grasper-bar 170 is mounted on the scraper-bar 140, and its front portion 171 is concealed in the hollow portion of the bar 140 out of the way of the coke and slides in the guideways 142 and 143 therein, and its elevated rear portion 172 moves through the upper guideways of the stationary frame, and it is provided with a short rear portion 173, which rests on the bar 140. The flexible connection between the

coke-grasper and its actuating-bar is shown in this instance in the form of an elongated link 180, pivoted at its rear end to the front end of said bar and at its front end to the lug 162 of said grasper.

Any suitable means are provided for actuating the grasper-bar 170 to raise or lower the grasper 160. The means shown for this purpose comprises a lever 190, pivoted to an arm 129, attached to the guideway 127 of the carriage and carrying at its outer end an automatic clamp. This clamp is shown as consisting of a box 191, through which the bar 170 is passed, said box being provided with upwardly-projecting lugs 192 and 193 and with a slot 194 in its upper side. An eccentric 195 is pivoted at 196 to said lugs and falls through the slot 194, resting normally in front of its eccentric pivot upon the upper face of the bar 170, whereby it is adapted to operate as a clamp to bite and hold said bar when the box is moved forward. This clamp is provided with an automatic means for releasing the bar 170 when it has made a sufficient thrust to place the coke-grasper in operative position, whereby any danger of breakage of the parts is avoided. To this end the clamp-disk is provided with a stud 197, and an arm 198 is attached to the guideway 127 or other part of the carriage adjacent to the lever 190 and carries an inclined face 199, and when the forward thrust of the clamp is completed the lug 197 on the disk 195 rides up on the incline 199 and releases the bar 170. A spring 170′ connects the arm 198 with the lever 190 and tends to swing the latter toward the former and render the clamp normally inactive. This lever is provided with a usual locking device, as 191′, for holding it in adjustable position. The arm 129 has an arc-shaped retaining-bar 129′ at its outer end provided with stops *d* and *e* for the lever and notches *f* and *g* for the locking device.

A suitable locking means is provided for holding the coke-grasper in operative position when released by the clamp and during the outward stroke of the coke-puller. The locking means herein shown comprises a pawl 200, pivoted to the bar 170 and adapted to engage the notch or stop 145 in the bar 140, and a spring 205 for positively actuating said pawl. A spring 210 is connected at one end to the bar 140 and at the other end to the bar 170 and tends to retract the latter and hold it in retracted position when the grasper is adjusted for the instroke.

Means conveniently accessible to the operator in whatever position the coke-puller may be are provided for releasing the locking device between the bars 140 and 170. The means shown comprises a beveled lug 201, depending from one side of the pawl 200, and a release-rod 220, adapted to slide in the channel or recess 144 in the bar 140. This release-rod is provided at its rear end with a roller-stud 221, adapted to engage said inclined lug, and a spring 225, connected at one end to said release-rod and at the other end to the bar 140, tends to hold said release-rod out of contact with the pawl. This release-rod is provided with ratchet-teeth 222, and a lever 230, pivoted to a bracket 231, attached to the guideway 127, is provided with a pawl 232, which engages the ratchet-teeth of the release-rod. The arm or bracket is provided with a stop 233 for said lever, and a spring 234, connected at one end with said lever and at the other end to said arm, tends to hold the lever in retracted position. The ratchet-teeth extend along the release-bar a sufficient distance to enable the bar to be readily grasped by the actuating-lever in the different positions of the coke-puller. The arm 231 is provided with a stop 238, which holds the pawl 232 out of contact with the ratchet-teeth when the lever is in its normal position. A stop 237 at the inner end of the lever 230 limits the swing of the pawl. A spring 235 tends to press the pawl toward the release-rod.

In the use of this coke-drawing apparatus when the oven is ready to be discharged the machine-car 50 and the receiving-car 30 are moved into position opposite the lateral oven-opening 12, the closure of which is removed, the engine is started and the driving-shaft moves in the direction of the arrow 73 in Fig. 1. The operator then by the lever 106 shifts the clutch 104 into engagement with the pinion 102 on the vertical shaft 100. The coke-puller is thereby thrust into the oven, and the scraper thereof moves over the bottom of the oven a sufficient distance to make a proper drawing of the coke. On this instroke of the coke-puller the plate 160, constituting the beveled face of the scraper, is in lowered or closed position and operates as a wedge to lift the coke above it from the caked mass of coke within the oven. At the end of the instroke the lever 106 is shifted so as to disconnect the pinion 102 from the shaft 100, and the inward movement of the coke-puller is stopped. Then the lever 190 is moved toward the right, and the clamp 195 engages the bar 170 and imparts thereto an inward thrust sufficient to raise the plate 160 into active position, as indicated in dotted lines in Fig. 1, and the pawl 200 engages the notch 145 and holds said plate in raised position. This upward swing of the plate 160 lifts the mass of coke immediately above said plate and thrusts it behind said plate and places the plate in position to engage the depth of loosened coke above the body of the scraper on the outward stroke. The operator then shifts the lever 106 and brings the clutch 104 into engagement with the pinion 103, whereby the actuating-bar 140 is retracted and the coke-puller withdrawn from the oven with its plate 160 in raised position, and substantially the whole mass of coke which was loosened on the instroke is discharged into the coke-car 30. Then the lever 106 is shifted to disconnect the clutch 104 from the gear 103, whereby the

retraction of the coke-puller is stopped. Then the lever 230 is made to operate the release-bar 220 and the locking-pawl 200 is lifted out of the notch 145 on the bar 140 and the bar 170 is pulled back by its spring 210, closing the plate 160, ready for another stroke. The first few strokes of the coke-puller are preferably in a direct line at right angles to the tracks, two or more drawings being usually required to remove the coke throughout a diameter of the coke-oven. After this is done lateral thrusts of the coke-puller are made first to one side and then to the other, the swiveling carriage being shifted for this purpose by the operator through the manipulation of the crank-wheel.

I claim as my invention—

1. In a coke-puller the combination of an underworking wedge-like scraper movable over the bottom of a coke-oven and adapted on its instroke to loosen coke for withdrawal, a swinging coke-grasper hinged to said scraper, and means connected with the under side of said grasper for adjusting it into holding position on the outstroke.

2. In a coke-puller the combination of an underworking wedge-like scraper movable over the bottom of a coke-oven and adapted on its instroke to loosen coke for withdrawal, a swinging plate hinged thereto and constituting the front thereof, and means connected with the under side of said plate for adjusting it in holding position on the outstroke.

3. A coke-puller comprising a bar, an underworking wedge-like scraper secured to the end of said bar, a swinging plate hinged to said scraper, an actuating-bar for adjusting said plate, and an elongated link connecting said swinging plate with said actuating-bar.

4. In a coke-puller the combination of an underworking wedge-like scraper movable over the bottom of a coke-oven and adapted on its instroke to loosen coke for withdrawal, a bar to which said scraper is secured, a grasper connected with said scraper, a grasper-bar connected with said grasper and a clamping device for moving said grasper-bar to adjust the grasper in operative position.

5. In a coke-puller the combination of an underworking wedge-like scraper movable over the bottom of a coke-oven and adapted on its instroke to loosen coke for withdrawal, a bar to which said scraper is secured, a grasper connected with said scraper, a grasper-bar connected with said grasper, a clamping device for moving said grasper-bar to adjust the grasper in operative position, and a locking device for holding the grasper in operative position.

6. In a coke-puller the combination of an underworking wedge-like scraper movable over the bottom of a coke-oven and adapted on its instroke to loosen coke for withdrawal, a bar to which said scraper is secured, a grasper connected with said scraper, a grasper-bar connected with said grasper, a clamping device for moving said grasper-bar to adjust the grasper in operative position, and an automatic locking device for holding the grasper in operative position.

7. In a coke-puller the combination of an underworking wedge-like scraper movable over the bottom of a coke-oven and adapted on its instroke to loosen coke for withdrawal, a bar to which said scraper is secured, a grasper connected with said scraper, a grasper-rod connected with said grasper, a clamping device for moving said grasper-rod to adjust the grasper in operative position, an automatic locking device for holding the grasper in operative position, and means for releasing the locking device.

8. In a coke-puller the combination of an underworking wedge-like scraper movable over the bottom of a coke-oven and adapted on its instroke to loosen coke for withdrawal, a bar to which said scraper is secured, a grasper connected with said scraper, a grasper-rod connected with said grasper, a clamping device for moving said grasper-rod to adjust the grasper in operative position, and an automatic device for releasing the clamp when the proper adjustment is effected.

9. In a coke-puller the combination of an underworking wedge-like scraper movable over the bottom of a coke-oven and adapted on its instroke to loosen coke for withdrawal, a bar to which said scraper is secured, a grasper connected with said scraper, a grasper-rod connected with said grasper, a clamping device for moving said grasper-rod to adjust the grasper in operative position, an automatic locking device for holding the grasper in operative position, means for releasing the locking device, and an automatic device for releasing the clamp when the proper adjustment is effected.

10. In a coke-puller the combination of an underworking wedge-like scraper movable over the bottom of a coke-oven and adapted on its instroke to loosen coke for withdrawal, a swinging coke-grasper hinged to said scraper, means for adjusting said grasper into position for holding coke on the outstroke, and means for automatically controlling the adjustment.

11. In a coke-puller the combination of an underworking wedge-like scraper movable over the bottom of a coke-oven and adapted on its instroke to loosen coke for withdrawal, a swinging coke-grasper hinged to said scraper, means connected with the under side of said grasper for adjusting it into position for holding coke on the outstroke, and means for automatically controlling the adjustment.

12. In a coke-puller the combination of an underworking wedge-like scraper movable over the bottom of a coke-oven and adapted on its instroke to loosen coke for withdrawal, a bar to which said scraper is attached, mechanism for reciprocating said bar, means connected with said scraper and adjustable after the instroke to engage and hold loosened coke above the scraper on the outstroke, a bar con-

nected with said adjustable means, and a hand-lever provided with a clamp for engaging said last-mentioned bar.

13. In a coke-puller the combination of an underworking wedge-like scraper movable over the bottom of a coke-oven and adapted on its instroke to loosen coke for withdrawal, means adjustable after the instroke to engage and hold loosened coke on the outstroke, and an automatic device for determining the adjustment of said means.

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Witnesses:
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