(No Model.) 6 Sheets—Sheet 1.

N. O. GOLDSMITH.

COKE DRAWING MACHINE.

No. 435,891. Patented Sept. 2, 1890.

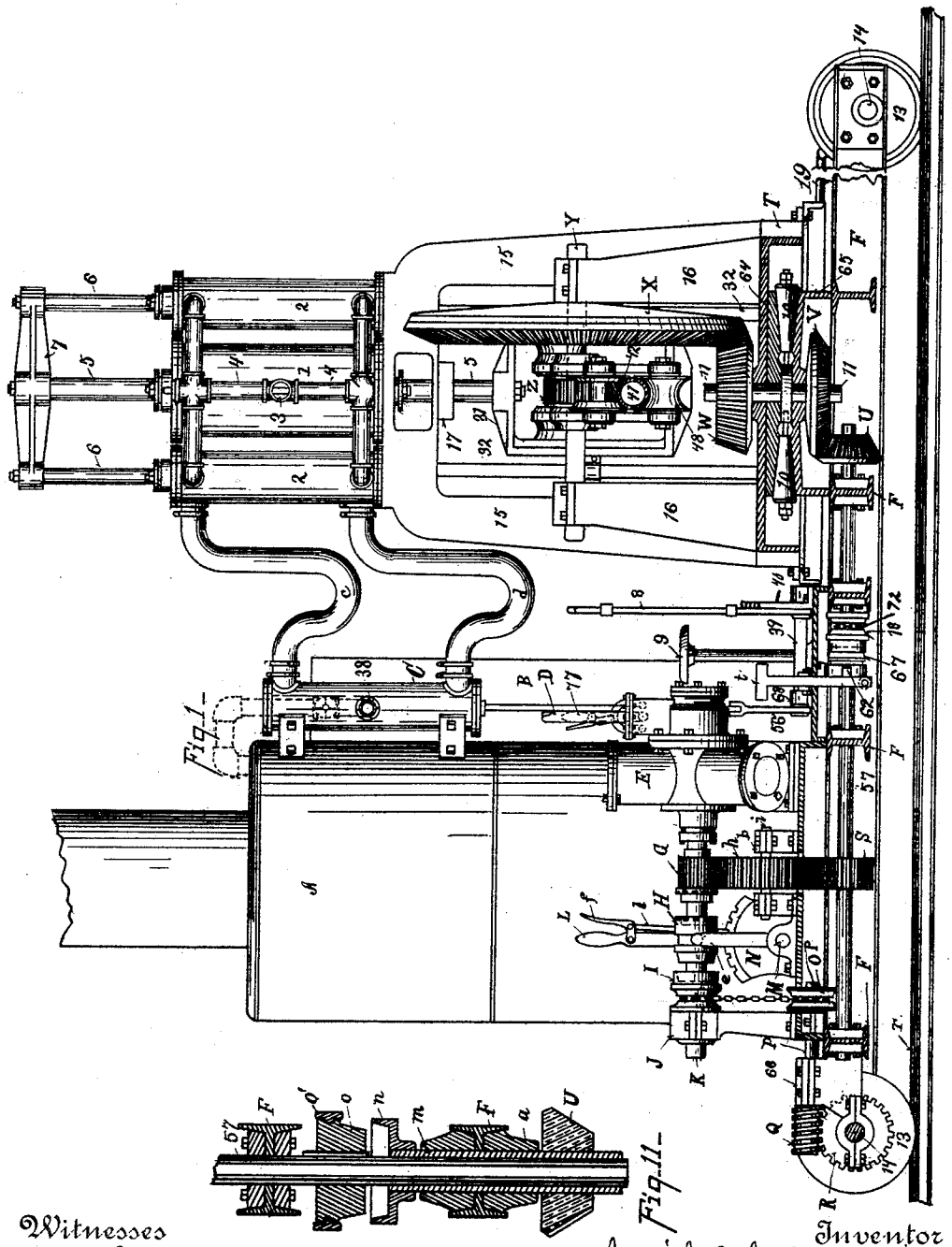


Fig. 1.

Fig. 11.

Witnesses
C. W. Miles
T. Simmons

Inventor
Nathaniel O. Goldsmith
By his Attorneys Wood & Boyd

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

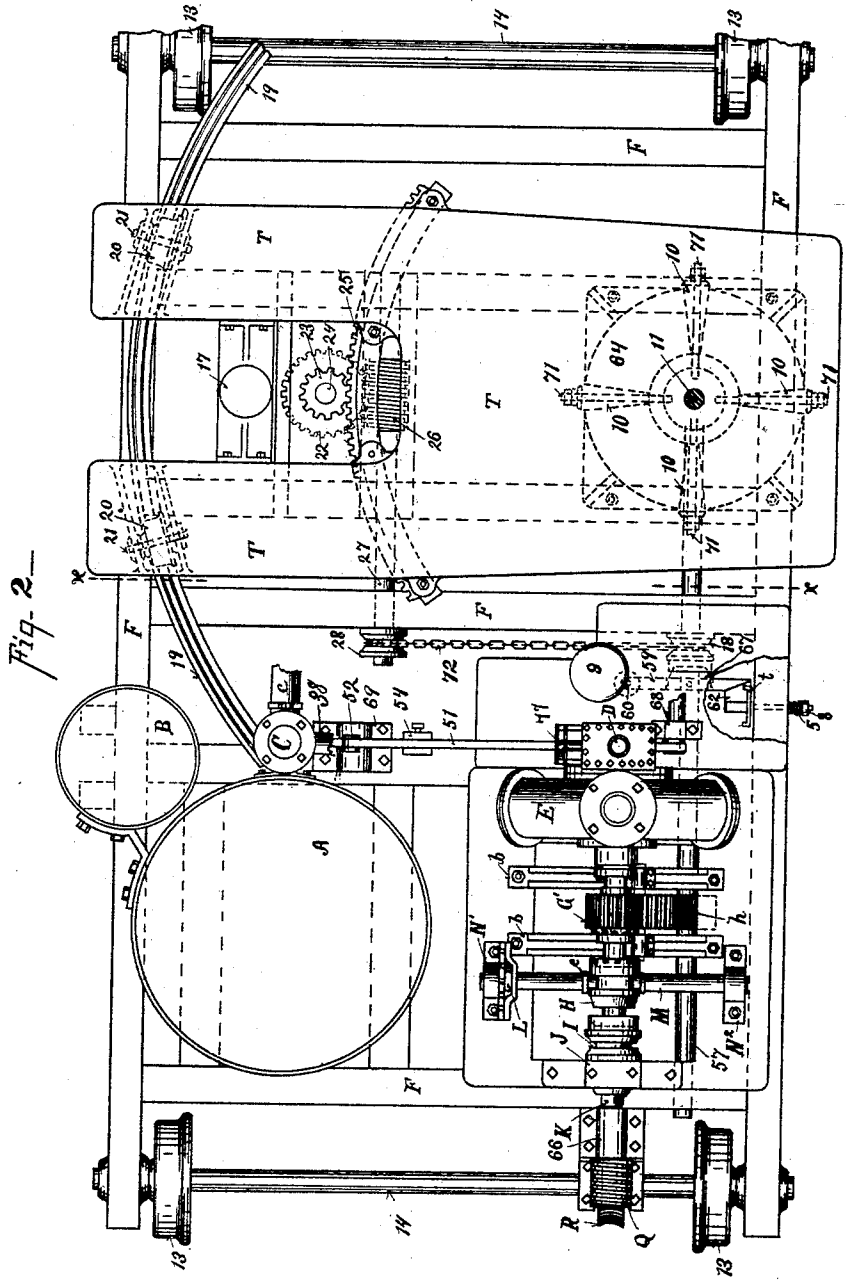
(No Model.) 6 Sheets—Sheet 2.

N. O. GOLDSMITH.

COKE DRAWING MACHINE.

No. 435,891. Patented Sept. 2, 1890.

Fig. 2.



Witnesses
C. W. Miles
T. Simmons

Inventor
Nathaniel O. Goldsmith
By his Attorneys Woods & Boyd.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

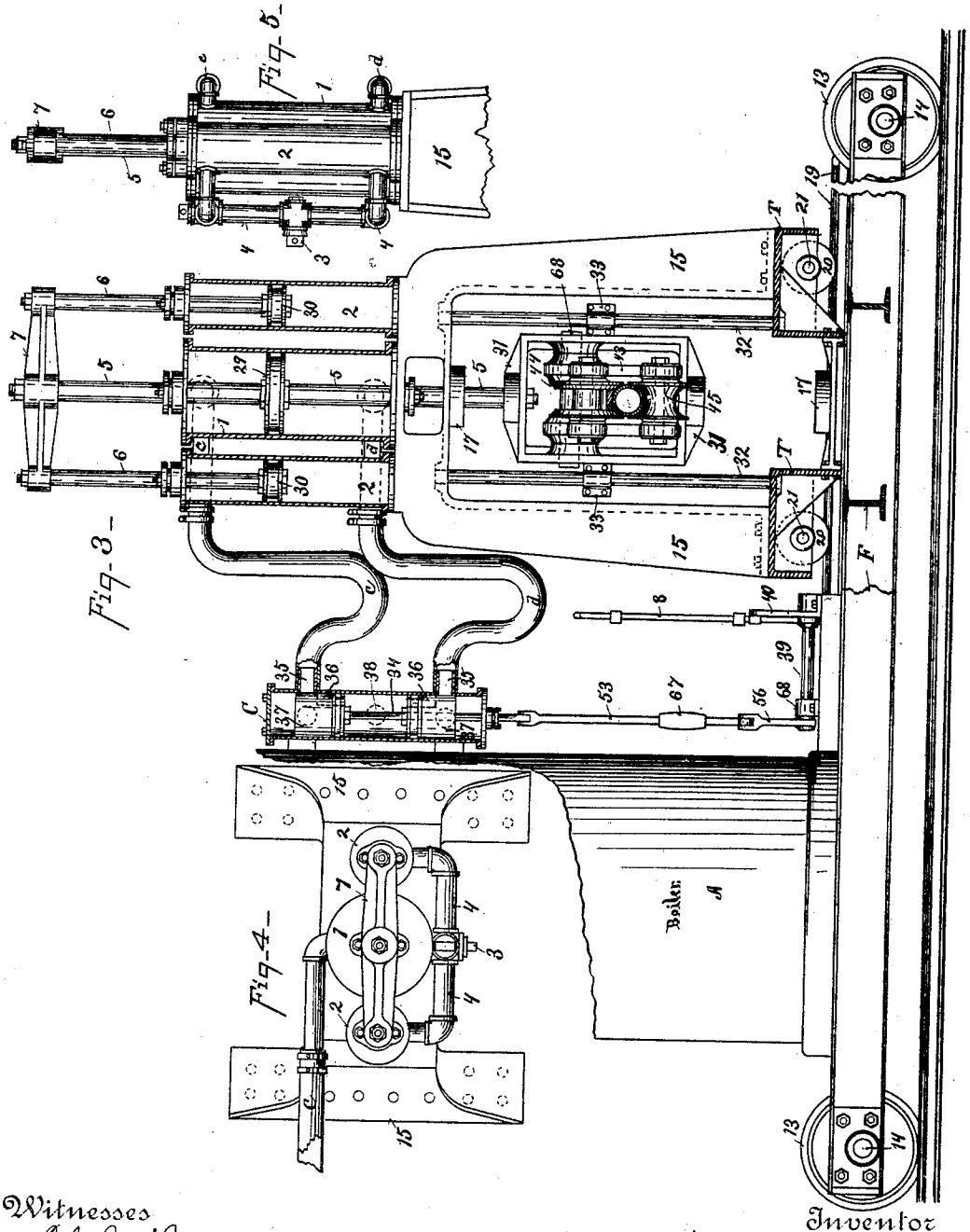
(No Model.)

6 Sheets—Sheet 3.

N. O. GOLDSMITH.

COKE DRAWING MACHINE.

No. 435,891. Patented Sept. 2, 1890.



Witnesses
C. W. Miles.
T. Simmons

Inventor
Nathaniel O. Goldsmith
By his Attorneys Wood & Boyd.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 6 Sheets—Sheet 4.

N. O. GOLDSMITH.

COKE DRAWING MACHINE.

No. 435,891. Patented Sept. 2, 1890.

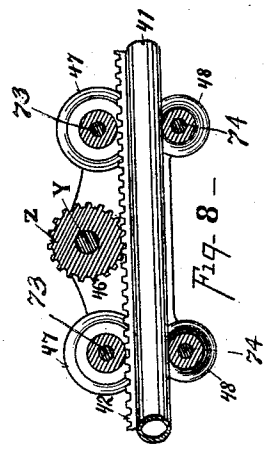


Fig. 8.

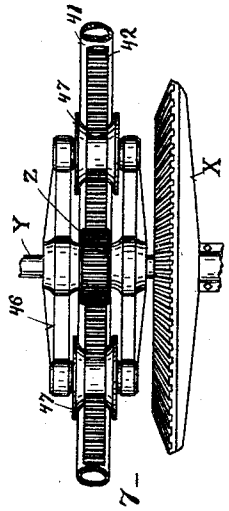


Fig. 7.

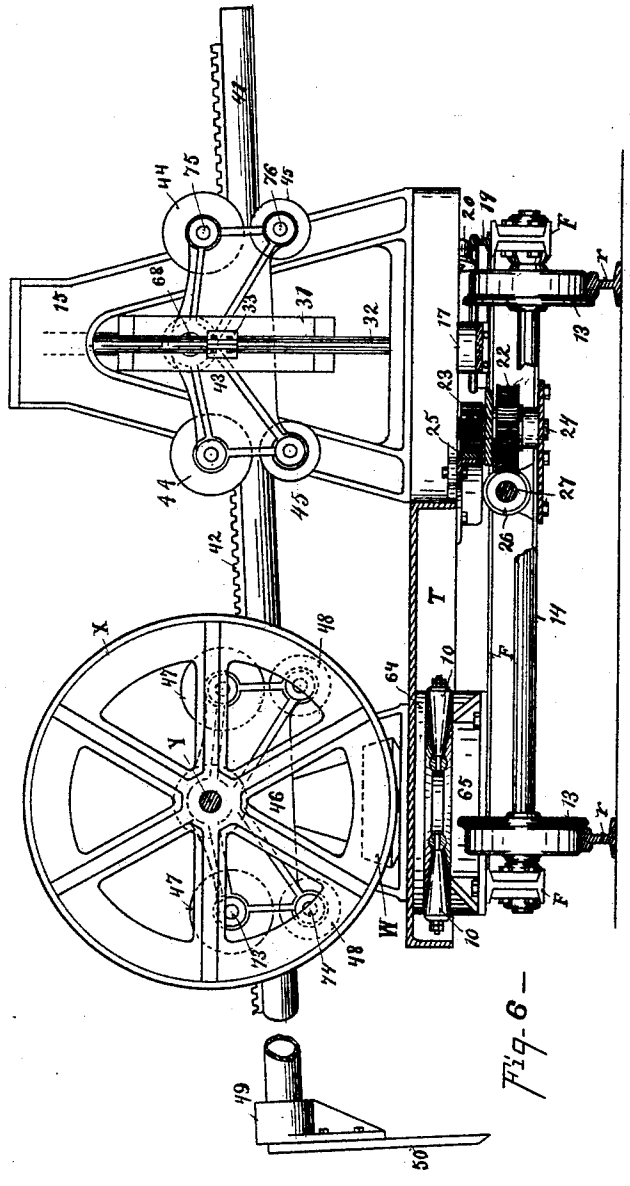


Fig. 6.

Witnesses,
C. W. Miles
T. Simmons

Inventor
Nathaniel O. Goldsmith
By his Attorneys Wood & Boyd

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 6 Sheets—Sheet 5.

N. O. GOLDSMITH.

COKE DRAWING MACHINE.

No. 435,891. Patented Sept. 2, 1890.

Fig. 9.

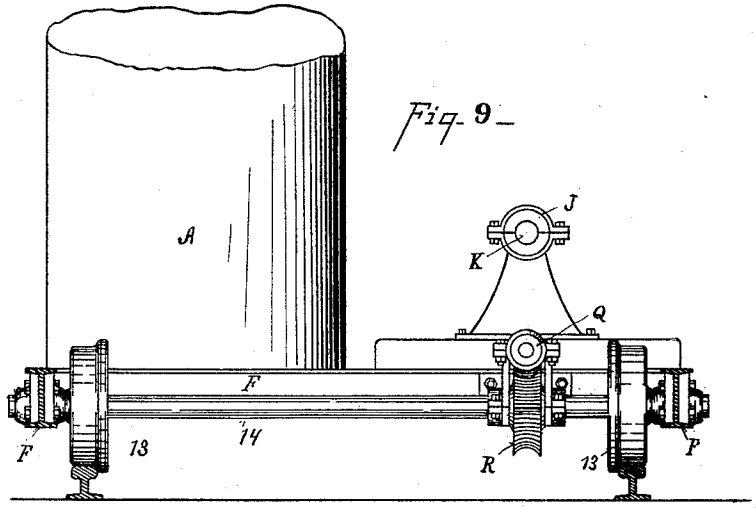
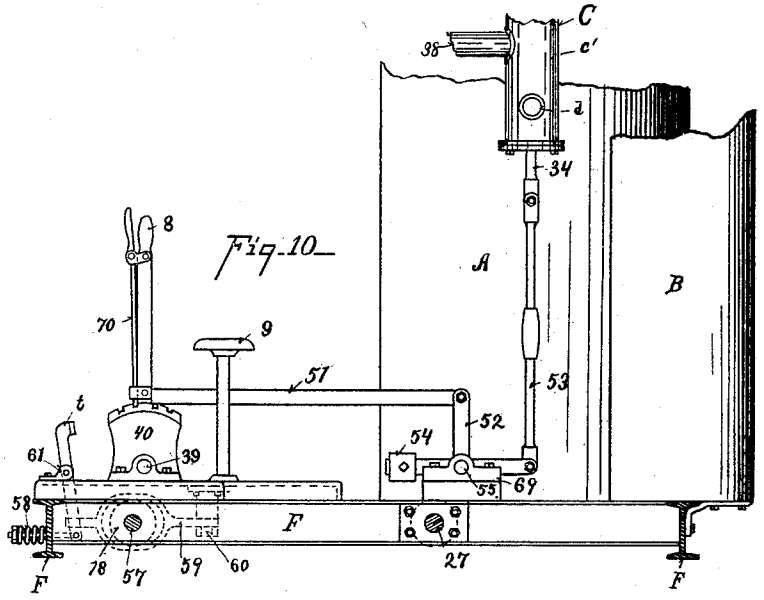


Fig. 10.



Witnesses,
C. W. Miles.
T. Simmons

Inventor
Nathaniel O. Goldsmith
By his Attorneys Wood & Boyd

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 6 Sheets—Sheet 6.

N. O. GOLDSMITH.

COKE DRAWING MACHINE.

No. 435,891. Patented Sept. 2, 1890.

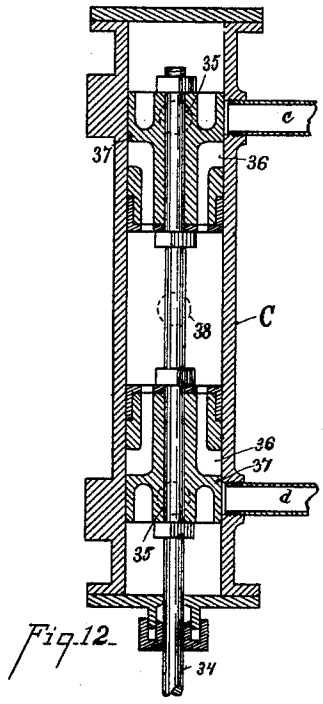


Fig. 12.

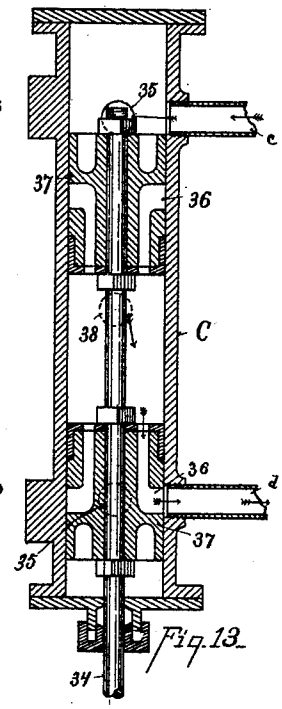


Fig. 13.

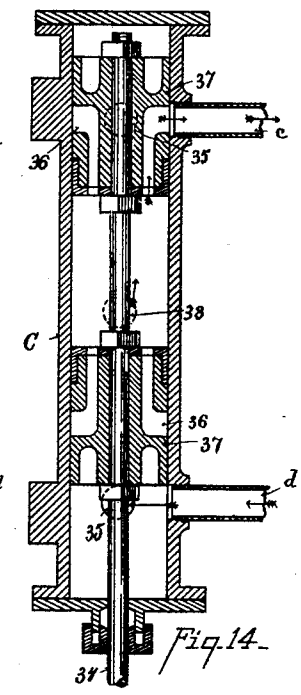


Fig. 14.

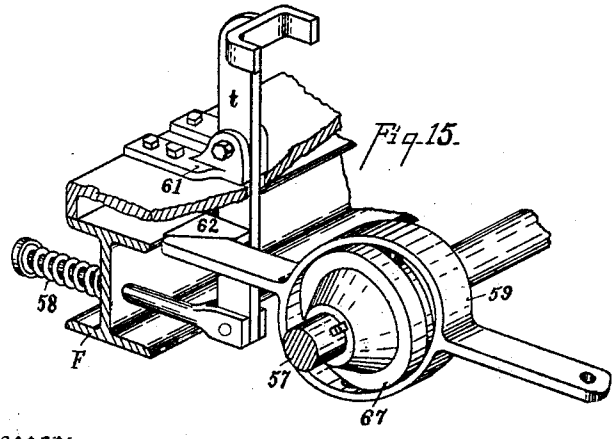


Fig. 15.

Witnesses:
C. W. Miles,
George Ashton

Inventor
Nathaniel O. Goldsmith
By his Attorneys Wood & Boyd

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

NATHANIEL O. GOLDSMITH, OF CINCINNATI, OHIO, ASSIGNOR TO THE WEIR FROG COMPANY, OF SAME PLACE.

COKE-DRAWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 435,891, dated September 2, 1890.

Application filed January 25, 1890. Serial No. 338,085. (No model.)

To all whom it may concern:

Be it known that I, NATHANIEL O. GOLDSMITH, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Coke-Drawing Machines, of which the following is a specification.

My invention relates to a new and improved device for drawing coke out of ovens. It comprises a driving device operated by an engine, preferably mounted upon a car which can be run back and forth in front of the oven, having an oscillating table upon which are mounted the guides for the reciprocating arm carrying the pulling-claws, with suitable mechanism for stopping, starting, tilting, and swinging the reciprocating claw-arm in a horizontal and in vertical planes, all of which is done with power furnished by the boiler.

The description of the accompanying drawings makes a part of this specification, in which—

Figure 1 is a side elevation, part of the frame being broken away to show the operating mechanism. Fig. 2 is a top plan view. Fig. 3 is a view, partly in section and partly in elevation, showing more especially that part of the mechanism which raises and lowers the rake-arm. Fig. 4 is a plan view of the same, and Fig. 5 is a side elevation of the steam and fluid cylinders of the same. Fig. 6 is an end view, partly in section, showing the rake-arm-holding mechanism. Figs. 7 and 8 are details of the same. Fig. 9 is an end view in opposite direction from that of Fig. 6; and Fig. 10 is a section through line *x x*, Fig. 2, looking to the left. Fig. 11 is a detail view of the clutch mechanism for throwing the rake mechanism out of gear. Fig. 12 is a central vertical sectional view of the steam-piston valve, showing the pistons at one-half stroke. Fig. 13 is a similar view showing the pistons at the limit of the downstroke. Fig. 14 is a similar view showing the pistons at the limit of their upstroke. Fig. 15 is a detail broken perspective view of the clutch mechanism for effecting the lateral swing of the rake.

The same letters and numbers on the different sheets of the drawings refer to similar parts of the mechanism.

In Fig. 1, A represents a steam-boiler equipped with all necessary parts for safety and continuous working.

B represents a tank from which the boiler A is supplied.

C represents a piston steam-valve. (Shown in section, Figs. 3, 12, 13, and 14.)

D is a steam-pipe supplying the engine E with steam from the boiler A.

E represents the engine, preferably of the three-cylinder type, bolted to the frame F. The driving mechanism of this engine is not shown, as it may be of any desired form of construction, the three-cylinder type, however, being the most compact. 77 represents a handle for operating the steam-valves of the engine E.

F represents the frame, upon which the different parts of the machine are supported, and which is mounted on wheels 13 to constitute a platform-car adapted to travel on the rails *r*.

G represents a spur-pinion, having at one end clutch-teeth, and free to revolve on the shaft K, which is the crank-shaft of the engine.

H represents a clutch, which is free to slide along the shaft K, but revolves with it by means of a key or feather. On the end nearest the pinion G are clutch-teeth, which are the counterpart of those on G, by means of which the pinion G may be locked with the clutch H and revolve with it. On the other end of this clutch is a male part of the friction-clutch, which fits into the support of the chain-wheel I. This chain-wheel I is loose on the shaft K, but can be engaged and revolved by means of friction-clutch H.

J represents the end bearing for the shaft K, and is bolted to the frame F.

L represents a lever keyed to the shaft M, which shaft has bearings N′ and N″. On this shaft M is also keyed a forked arm *e*, swiveled to the clutch H, and by means of which it may be moved along the shaft K, so as to engage or disengage the clutch-teeth with either member G′ or I. The bearing N′ has

a segmental projection with notches, into which the catch *l* fits, so as to lock the lever L into any position it may be thrown.

f represents a latch-lever for lifting the catch *l* from the notches.

O represents a chain-wheel keyed on the shaft P, which has a bearing 66 fastened to the frame F.

Q represents a worm, also keyed on the shaft P. The worm Q meshes with the worm-wheel R, which is keyed on the axle 14. (Shown in plan, Fig. 2, and in end view, Fig. 9.)

13 represents car-wheels on the axles 14, which support the frame F and carry the same on the rails *r*.

57 represents a shaft having bearings on frame F, upon which shaft are fastened the spur-wheel S and the bevel-pinion U.

h represents a transmitting-gear fastened to the shaft *i* and journaled on the bearings *b*. This gear *h* meshes with the pinion G and the spur-gear S, so that the shaft 57 will be revolved with shaft K. On the shaft 57 is a loose chain-wheel 18 and friction-clutch 67, which is free to slide along the shaft, but revolves with it by means of a feather let into the shaft 57.

V represents a bevel-gear meshing with the bevel-pinion U, and keyed to the shaft 11, which passes through turn-tables 64 and 65, and also through the horizontally-oscillating table T, and has at its upper end a bevel-pinion W, which is fastened to it. Pinion W meshes with a bevel-gear X, which is keyed to the shaft Y, which has bearings 16 fastened to the oscillating table T. Z represents a gear keyed to shaft Y and meshing in rack 42 on rake-arm 41. On the oscillating table T is also fastened a frame 15, which supports a steam-cylinder 1 and two fluid-cylinders 2. (See Fig. 3.) The steam-cylinder 1 is connected to the valve C by means of flexible steam-pipes *c* and *d*. *c* taps the upper end of the steam-cylinder 1 and *d* taps the lower end of said cylinder. The upper and lower ends of the fluid-cylinders 2 are connected by means of pipes 4, in which is placed a throttle-valve 3. (Shown in Figs. 1 and 5.) The steam-cylinder 1 has a piston-rod 5, the upper end of which is attached to the piston-rods 6 of the fluid-cylinder by means of the yoke 7, and on the lower end is fastened a yoked frame 31, as shown in Fig. 3. On the piston-rod 5 is also the piston 29, sliding in the steam-cylinder 1. The piston-rods 6 have pistons 30 sliding in the fluid-cylinders 2.

The valve C, which has a connection 38 with the boiler A, contains two pistons 37, fastened to the stem 34. These pistons 37 have ports 36, Figs. 3, 12, 13, and 14, through which the steam is free to pass.

35 represents exhaust-ports of the valve C.

In Fig. 10, 8 represents a lever keyed to the shaft 39, which has bearings 40 and 68 fastened to the frame F.

53 represents a link connecting the valve-stem 34 with the bell-crank 52, which oscillate on the shaft 55, supported in bearings 69, also fastened to the frame F.

54 represents a counter-weight attached to the bell-crank 52.

51 is a link connecting the lever 8 with the bell-crank 52.

9 represents a seat for the operator.

70 represents a locking device fitting into the notches of the segment 40, and holding the lever 8 in its different positions.

t represents a treadle pivoted in a bearing 61, attached to the frame F, having at its lower end a spring 58 and a bevel-face 62, as shown in Figs. 2 and 15.

59 represents a yoked arm swiveled to clutch 67 and pivoted to the bearing 60, attached to the frame F. On the opposite end of the yoked arm 59 is a bevel-face, which fits the bevel-face 62 of the treadle *t*. The yoked arm 59 moves the friction-clutch 67 along the shaft 57 when the treadle *t* is pressed to the left. Between the turn-table 64, which is bolted to oscillating table T, and turn-table 65, which is fastened to the frame F, are rollers 10. (Shown in Figs. 2 and 6.) These rollers revolve on the pins 71 and support the oscillating table T at one end.

19 represents a tram-guide rail fastened to the frame F, upon which run wheels 20, revolving on axles 21, which are attached to the table T.

17 represents rubber bumpers, one of which is attached to the table T and the other to the frame 15, (shown in Fig. 3,) which are cushions against which the yoked frame 31 strikes to limit the upward or downward movement of frame 31.

25 represents a curved rack bolted to the oscillating table T. (Shown in Fig. 2.)

23 represents a spur-wheel meshing in the rack 25 and keyed to the shaft 24, on which is also keyed a worm-wheel 22, which meshes with the worm 26, which is fastened to shaft 27, to which the chain-wheel 28 is also fastened. The shaft 24 and also shaft 27 have bearings which are attached to the frame F. (Shown in Figs. 2 and 6.) The chain-wheel 28 is connected to the chain-wheel 18 by means of chain 72, as shown in Fig. 2.

In Fig. 6, 41 represents the rake-arm, on the upper side of which is attached a rack 42, and at one end is attached the pulling-claws 50 by means of the bracket 49.

On the shaft Y are two frames 46, which are free to oscillate and which carry the guide-rollers 47 and 48, which revolve on pins 73 and 74. These guide-rollers 47 and 48 form anti-friction journals for the rake-arm 41 and allow it to move freely back and forth. It can be swung in a vertical plane, because the frames 46 can turn on shaft Y. These rollers are shown in section in Fig. 8. To the yoked frame 31 are attached, by means of the stud 68, the frames 43.

44 and 45 represent guide-rollers, which are free to revolve on the pins 75 and 76, which are attached to the frame 43, and which

also allow the rake-arm 41 to move freely back and forth and to move in a vertical plane, the frames 43 and 46 oscillating on their respective journals. The yoked frame 31 has guides 33, (shown in Figs. 3 and 6,) which move vertically on the rods 32, which are supported by the frame 15 and the oscillating table T.

Mode of operation: By looking at Fig. 1 it will be seen that by throwing the lever L to the left the chain-wheel I will be locked to the clutch H by means of the friction-clutch faces. This will allow the operator to drive the worm Q and revolve the axle 14 by means of the worm-wheel R, and move the machine back and forth on the track *r* by means of the reversing-lever 77, which arranges the valves of the engine E so that the crank-shaft K shall revolve in either one direction or the other. I thus provide a self-propelling machine, and at the same time the worm Q locks the wheel R and keeps the machine from moving when the pressure of the rake on the coke would tend to move the machine on the track-rails *r*. If, on the contrary, he throws the handle L to the right the clutch H becomes disengaged from the chain-wheel I and is locked to the pinion G by means of the clutch-face, and when the shaft K revolves the spur-pinion G drives the transmitting-gear *h*, which in turn drives the gear S, which revolves the shaft 57 and turns the bevel-pinion U, the bevel-wheel V, the shaft 11, the bevel-pinion W, and the bevel-wheel X, the shaft Y, and the spur-wheel Z, which moves the rake-arm 41 by means of the rack 42. This will run the rake-arm 41 into the oven; but by reversing the engine, by means of lever 77, the direction of the movement of the rake-arm will be reversed and it will come out of the oven. By throwing the lever 8, Fig. 10, to the left the pistons 37 in the valve C, Fig. 3, are raised. The lower valve opens the exhaust-port 35 to the lower end of the steam-cylinder 1, and the upper valve opens port 36 and allows the steam to pass from the steam-port 38 into the steam-pipe *c*, admitting the steam into the top of the steam-cylinder 1. This forces the piston-rod 5 down and forces the fluid from the bottom of the fluid-cylinders 2 through the connecting-pipe 4 and the throttle-vale 3 into the top of the fluid-cylinders 2, the valve 3 affording the means of regulating the speed at which the piston-rod 5 travels. Inasmuch as the piston-rod 5 is attached to the yoked frame 31, it will be seen in Fig. 6 that when the piston-rod 5 is pushed down the end of the rake-arm 41, to which the pulling-claws 50 are attached, will be raised, swinging on the shaft Y. When the lever 8, Fig. 10, is pulled to the right, (or toward the operator,) however, the pistons 37, Fig. 3, will be pulled down, and the steam from the upper end of the cylinder 1 is free to pass through the steam-pipe *c* into the exhaust-opening 35, while at the same time steam will be admitted through the lower steam-port and the steam-pipe *d* into the lower end of the steam-cylinder 1, raising the piston 29 and the piston-rod 5, and forcing the fluid from the top of the cylinders 2 into the bottom and lowering the pulling-claws 50, Fig. 6. This arrangement affords a means of raising the pulling-claws of the rake-arm above the coke when the rake-arm is passing into the oven, and forcing it down on the coke when the rake-arm is passing out of the oven. When it is desired to swing the rake-arm to right or left while it is being reciprocated, the foot-treadle *t* is moved to the left in Fig. 10, and the yoked arm 59 is thereby moved to the right in Fig. 2, forcing the friction-clutch 67 into the chain-wheel 18, and causing the same to revolve with the shaft 57. This motion of the treadle compresses the spring 58, and as soon as the treadle is released the spring forces it back into its natural position, releasing the clutch and stopping the lateral swinging movement of the rake-arm. While the treadle is pushed to the right, however, and while the shaft 57 is revolving, the chain-wheel 18 revolves the chain-wheel 28 by means of the chain 72, and turns the shaft 27 and the worm 26, the worm-wheel 22, and the gear 23 by means of the shaft 24, and swings the table T to the right or to the left by means of the rack 25. It will be seen that this table rides on the wheels 20, traveling on the rail 19. (See Fig. 2.) Said table is pivoted at the opposite end by the shaft 11, and supported on the conical rollers 10, which bear on the turn-table faces 64 and 65 and allow it to swivel freely. Inasmuch as all the guides and bearings for the rake-arm 41 are attached to this oscillating table T, it will be observed that the rake-arm can move in a horizontal plane, and by regulating the time which the foot-treadle is pressed the pulling-claw 50 can be swung from side to side in any part of the oven. This gives the operator complete control of the rake by means of the reversing-lever 77, which controls the means of moving the rake back and forth, and the lever 8, which controls the raising and lowering mechanism, and the foot-treadle *t*, which controls the mechanism for moving the rake horizontally, and allows him to operate the rake very rapidly and easily.

In Fig. 11 is shown a modification in the mechanism for propelling the rake backward and forward. It will be noticed that, as heretofore described, the chain-wheels 18 and 28 and mechanism for oscillating table T could only be operated while the gear U, and consequently the rake, was in motion. The modification in Fig. 11 provides for the operation of chain-wheels 18 and 28 while the gear U remains idle, and is a representation of that part of shaft 57 which lies to the right of chain-wheel 18. F represents the frame in which the shaft is mounted; 57, the shaft; U, the gear-wheel; *a*, a boxing secured to frame F, in which revolves a hollow sleeve *m*, through which passes the shaft 57. The wheel U is secured to one end of sleeve *m*, and to the

other is fastened the female portion *n* of a friction-clutch. *o* represents the male portion of the friction-clutch connected to a yoke O′, which, being operated by a treadle and devices substantially the same as used to operate the clutch 67, Fig. 15, is not more fully illustrated. By means of this device the gear U may be thrown into and out of engagement with the shaft 57 and the table T swung independently from the backward and forward movement of the rake.

The object of my invention is to provide a rake operated by steam-power and so arranged that the rake may have a motion in a vertical and horizontal plane and move in any position without producing any strain on the different parts of the machine which will tend to interfere with their moving freely.

In respect to the motion of the rake in and out of the oven it will be seen that the planetary system of gears, including bevel-pinion U, bevel-gear V, bevel-pinion W, and bevel-gear X, allows the gear Z on the shaft Y to always occupy a position at right angles to the rack 42 on the rake-arm 41, and by this means there is no position in a horizontal plane limited by the motion of the table T in which the rake-arm 41 cannot be driven in and out of the oven.

I have shown the mechanism here described as adapted to be moved by the operator seated on seat 9, who manipulates the levers to get the various desired movements. As the rake has to be inserted into the oven to varying distances in the operation of pulling the coke, and as the rake is driven by steam and controlled by admitting and cutting off the steam, I avoid the use of windlass and ropes for reciprocating the rake-arm.

I believe I am the first to provide a machine which will control the operation of the rake and the pulling device by manipulation of the levers for controlling the different rake movements vertically and horizontally as well as controlling the length of the stroke.

The fluid-cylinders 2 are merely to regulate the speed at which the piston-rod 5 travels, either up or down, and this speed can be controlled by the opening in the throttle-valve 3, allowing a greater or less quantity of fluid to pass through it.

The steam-pipes *c* and *d* are made flexible so that the steam may always pass into the steam-cylinder 1, in whatever position the oscillating table T may occupy.

I do not confine myself to the specific construction or arrangement of parts shown by the drawings. The piston steam-valve C, the three cylinder-engines E, the desired arrangement of parts to make the machine a self-propelling one, and the arrangement of parts to move the table T back and forth in a horizontal plane can be variously modified without interfering with the utility and successful working of the machine and still present the principal features of my invention.

Having described my invention, what I claim is—

1. In a coke-drawing machine, the combination of a swiveled table, a rising and falling yoke or frame, an oscillatory frame carried by the yoke or frame, a reciprocating rake supported by the oscillatory frame, an engine, means operated by the engine to turn the table, reciprocate the rake, and raise and lower the yoke or frame, and clutch mechanism for reversing the turning motion of the table, substantially as described.

2. In a coke-drawing machine, the combination of an engine, a cylinder containing a piston, means for admitting a working-fluid to the cylinder, a swiveled table carrying the cylinder, a vertically-movable yoke-frame supported by guides on the table and connected with the piston of the cylinder, an oscillatory frame supported by the yoke-frame, a rake moving on the oscillatory frame, and mechanism operated by the engine for turning the table and reciprocating the rake, substantially as described.

3. In a coke-drawing machine, the combination, with a supporting-platform, of a table on the latter, a rigid frame secured to the table, an engine, a cylinder containing a piston and mounted on the frame, a valve to admit the working-fluid for operating the piston in the piston-cylinder, a rising and falling yoke-frame supported by the rigid frame and connected with the piston, an oscillatory frame journaled in the yoke-frame, a rake supported by and reciprocating on the oscillatory frame, and mechanism operated by the engine for reciprocating the rake, substantially as described.

4. In a coke-drawing machine, the combination, with a portable platform, of an engine and a swiveled table mounted on the platform, a rising and falling yoke-frame, an oscillatory frame carried by the yoke-frame, a cylinder containing a piston connected with the yoke-frame, a valve to admit the working-fluid for operating the piston-cylinder, a rake carried by and reciprocating on the oscillatory frame, and gearing actuated by the engine to turn the table and reciprocate the rake, substantially as described.

5. In a coke-drawing machine, the combination, with a supporting-platform, of an engine and a swiveled table on the platform, a segmental rack secured to the table, a reciprocating rake supported by the table, and gearing connected with the table-rack and the rake and operated by the engine to turn the table and reciprocate the rake, substantially as described.

6. In a coke-drawing machine, the combination, with a supporting-platform, of an engine and a swiveled table mounted on the platform, a rigid frame on the table, a rising and falling yoke-frame supported by the rigid frame, an oscillatory frame carried by the yoke-frame, a rake supported by and reciprocating

on the oscillatory frame, a cylinder containing a piston connected with the yoke-frame, a valve controlling the passage of the working-fluid to the piston-cylinder, means for operating the valve to reverse the stroke of the piston-cylinder, a shaft rotated by the engine and geared to the table and rake, and clutch devices for throwing the shaft into and out of gear with the engine, substantially as described.

7. In a coke-drawing machine, the combination, with a platform-car, of an engine and a swiveled table mounted on the platform, a reciprocating rake supported by the table and having a rack, an engine-shaft geared to one of the car-axles, a counter-shaft rotated by the engine-shaft and geared to the rack on the rake, clutch devices for throwing the engine-shaft into and out of gear with the car-wheel and the counter-shaft, and rack-and-pinion mechanism actuated by the engine for turning the table, substantially as described.

8. In a coke-drawing machine, the combination, with a platform-car, of an engine and a swiveled table mounted on the car, a worm-wheel on the car-axle, a worm-shaft connected with the engine-shaft, a reciprocating rake supported by the table and having a rack, a counter-shaft driven by the engine-shaft and geared to the rack on the rake for reciprocating the same, clutch devices for throwing the engine-shaft into and out of gear with the worm-shaft and the counter-shaft, and rack-and-pinion mechanism actuated by the engine for turning the table, substantially as described.

9. In a coke-drawing machine, the combination of a supporting-platform having a segmental tramway, a pivot-shaft, an oscillating table resting at one end on the tramway and at the opposite end mounted on the pivot-shaft, rolling supports for the table, a segmental rack on the table, a reciprocating rake supported by the table, and gearing engaging the rack and the rake for oscillating the table and reciprocating the rake, substantially as described.

10. In a coke-drawing machine, the combination of the oscillating frames 43 and 46, each carrying guide-rollers, with the reciprocating rake moving between the guide-rollers and oscillating with the frames, and means for reciprocating the rake and raising and lowering one of the oscillating frames, substantially as described.

11. In a coke-drawing machine, the combination of the shaft Y, provided with gear Z, an oscillating frame 46, arranged on said shaft and having guide-rollers, a vertically-movable yoke-frame 31, carrying an oscillating frame 43 having guide-rollers, means for raising and lowering the yoke-frame, and the rake 41, having a rack engaging the gear, substantially as described.

12. In a coke-drawing machine, the combination of a swiveled table, a rising and falling yoke-frame supported by guides on the table, an oscillating guide-frame journaled on the yoke-frame, a rake moving on the guide-frame, mechanism operated by the engine for turning the table and reciprocating the rake, power-driven mechanism which automatically raises and lowers the yoke-frame, and a lever which controls the automatic action of the power-driven mechanism at the will of the attendant, substantially as described.

In testimony whereof I have hereunto set my hand.

NATHANIEL O. GOLDSMITH.

Witnesses:

C. W. MILES,

T. SIMMONS.