

No. 768,067.

PATENTED AUG. 23, 1904.

W. H. McCONNELL.
COKE EXTRACTOR.

APPLICATION FILED MAR. 29, 1904.

NO MODEL.

5 SHEETS—SHEET 1.

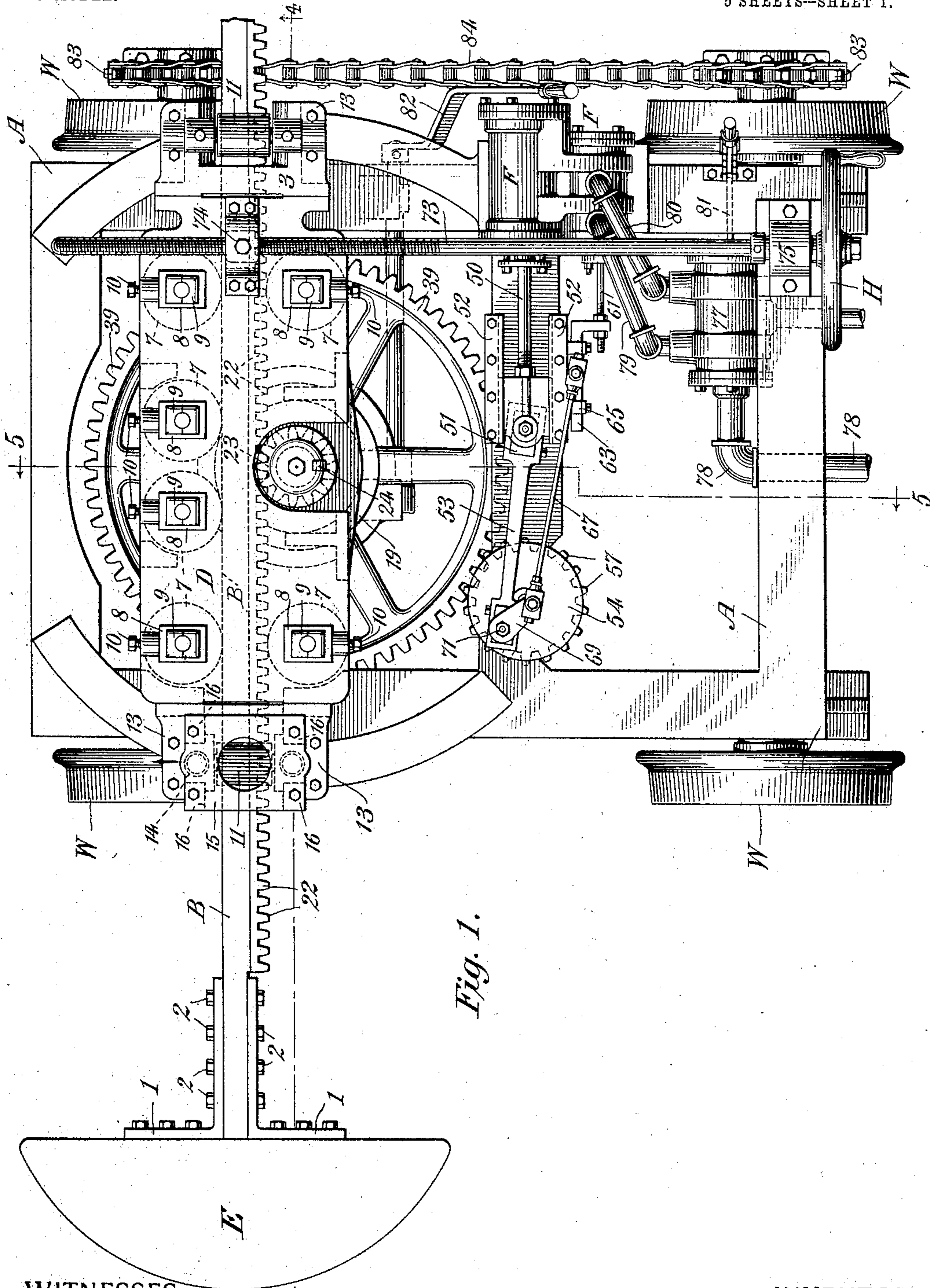


Fig. 1.

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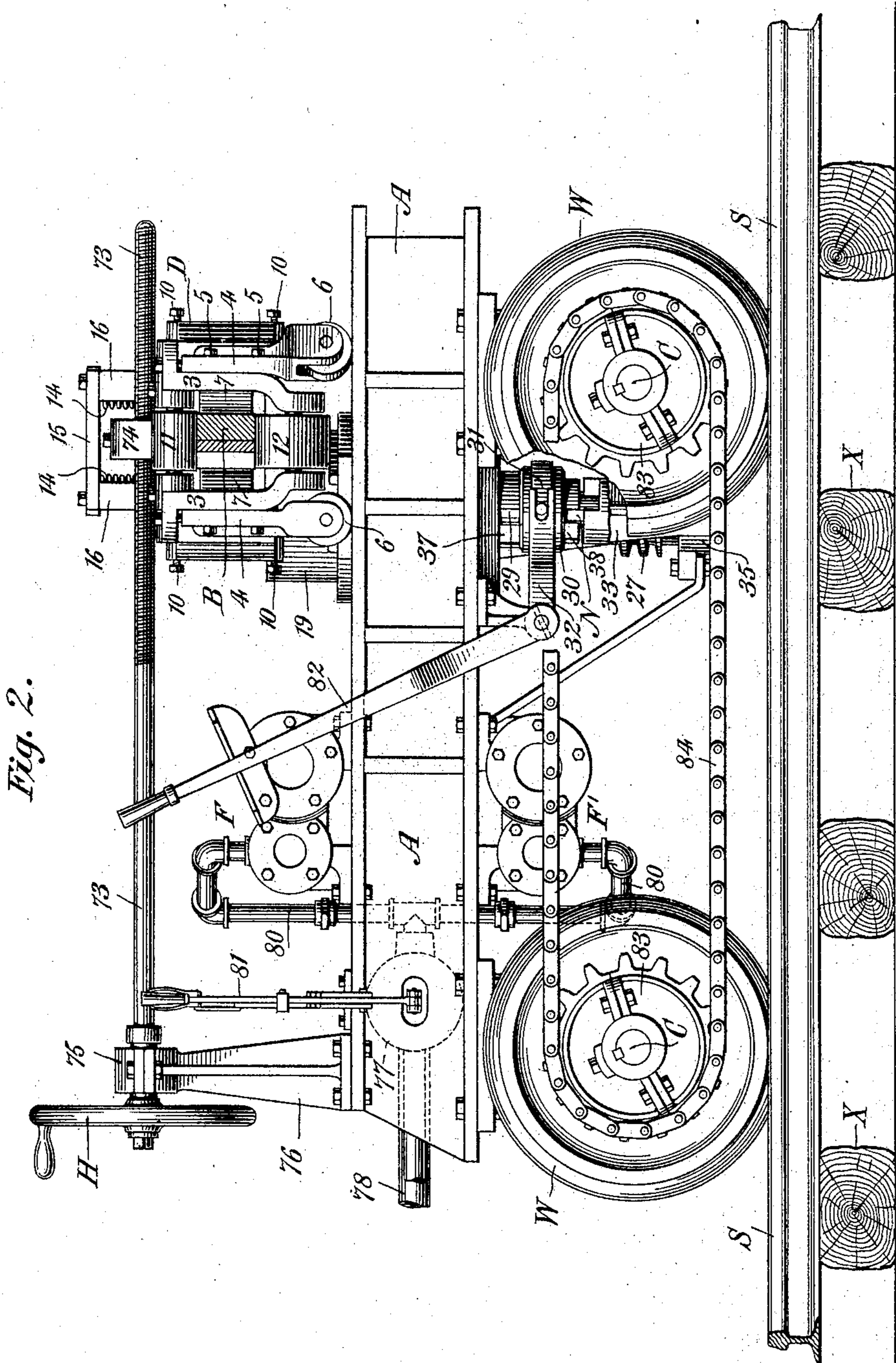
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5 SHEETS—SHEET 2.



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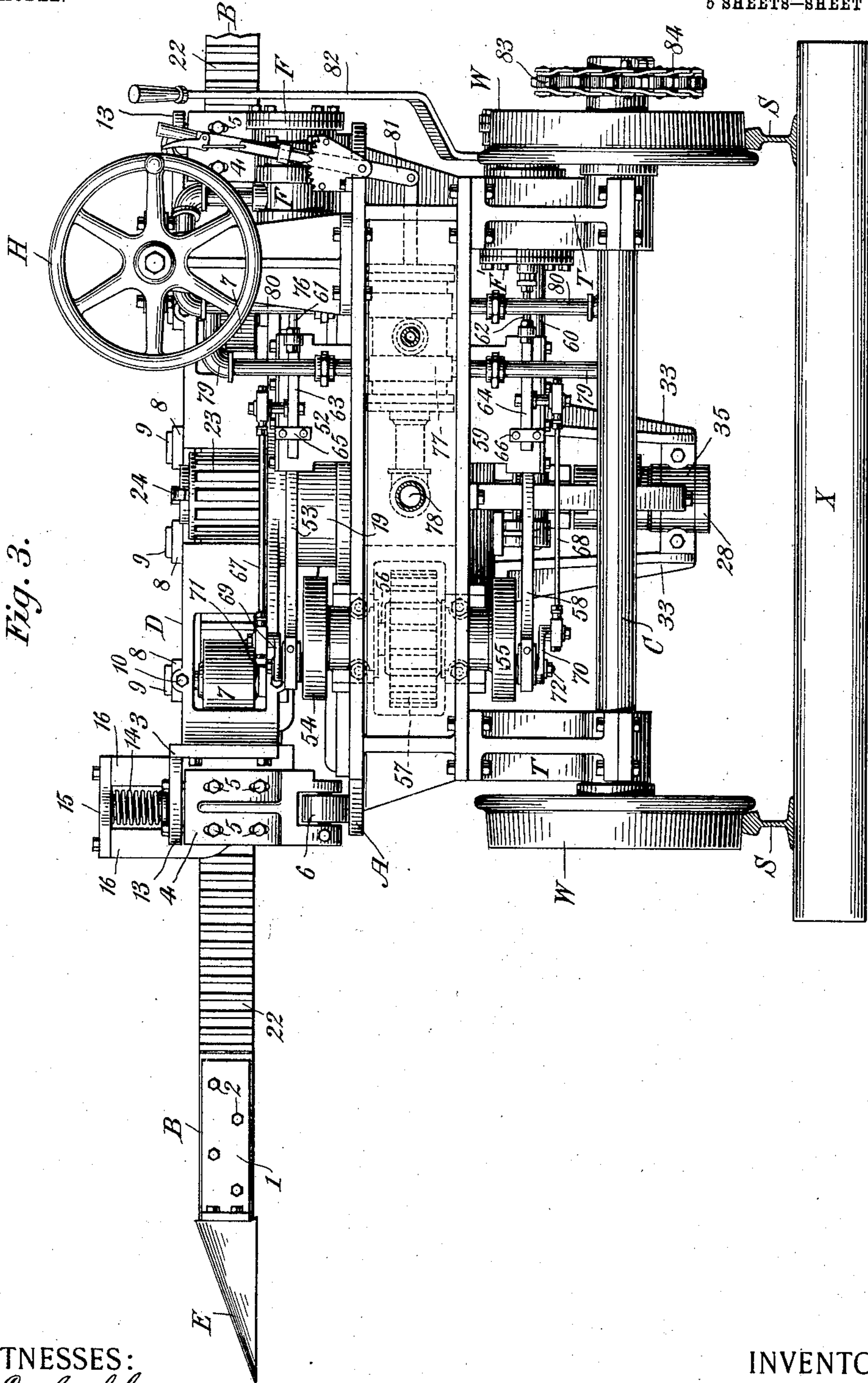
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5 SHEETS—SHEET 3.



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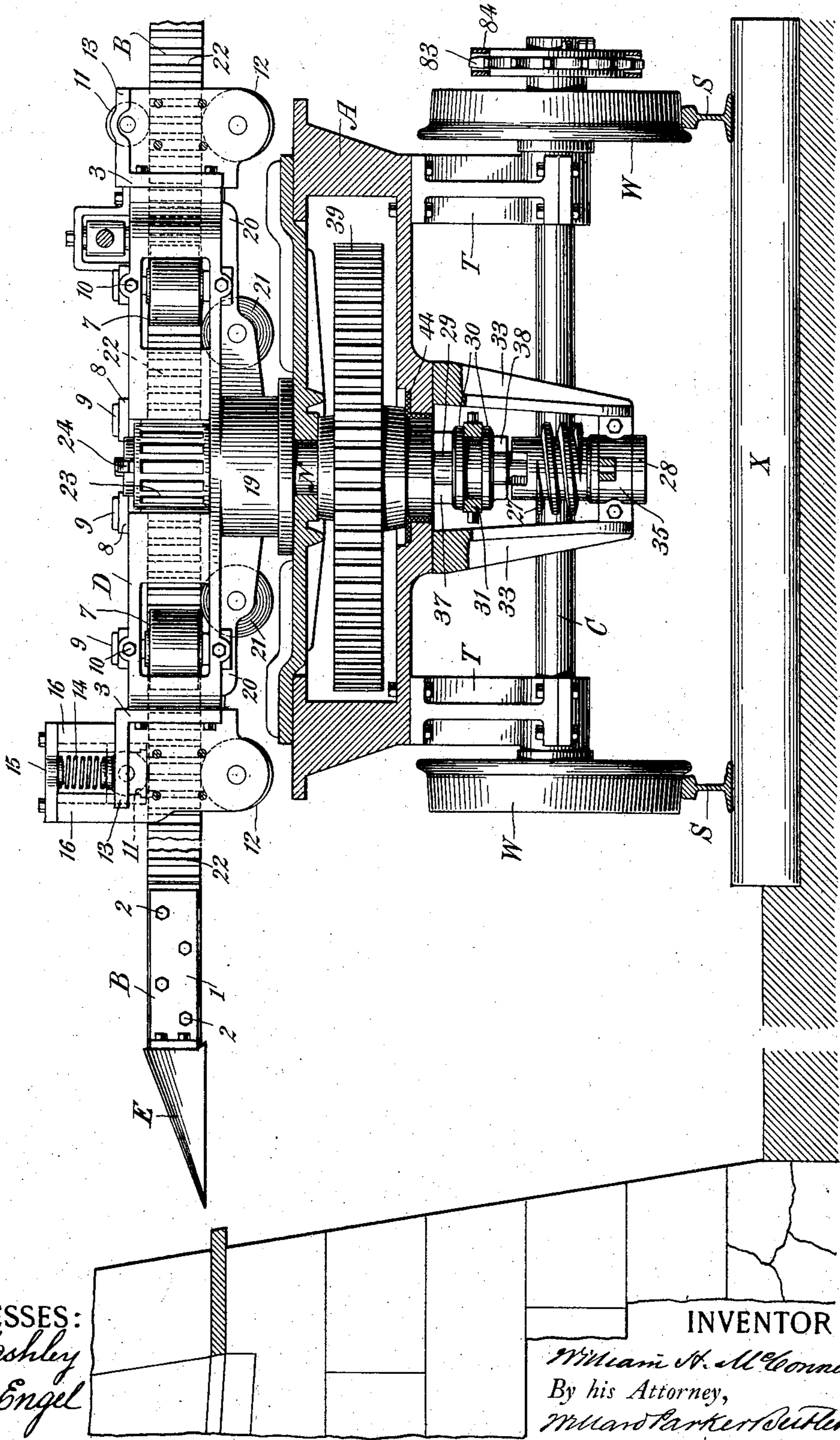
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5 SHEETS—SHEET 4.

Fig. 4.



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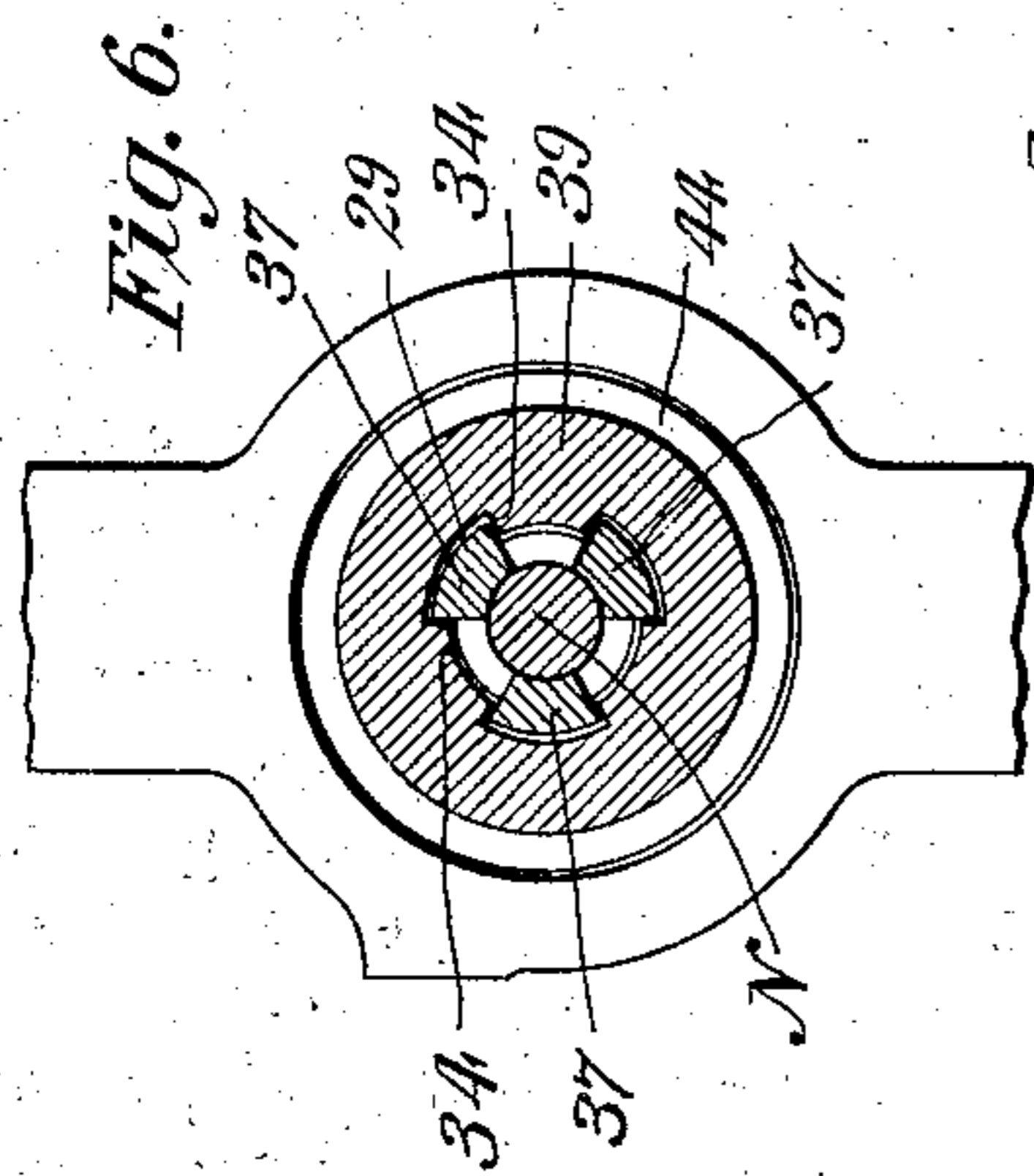
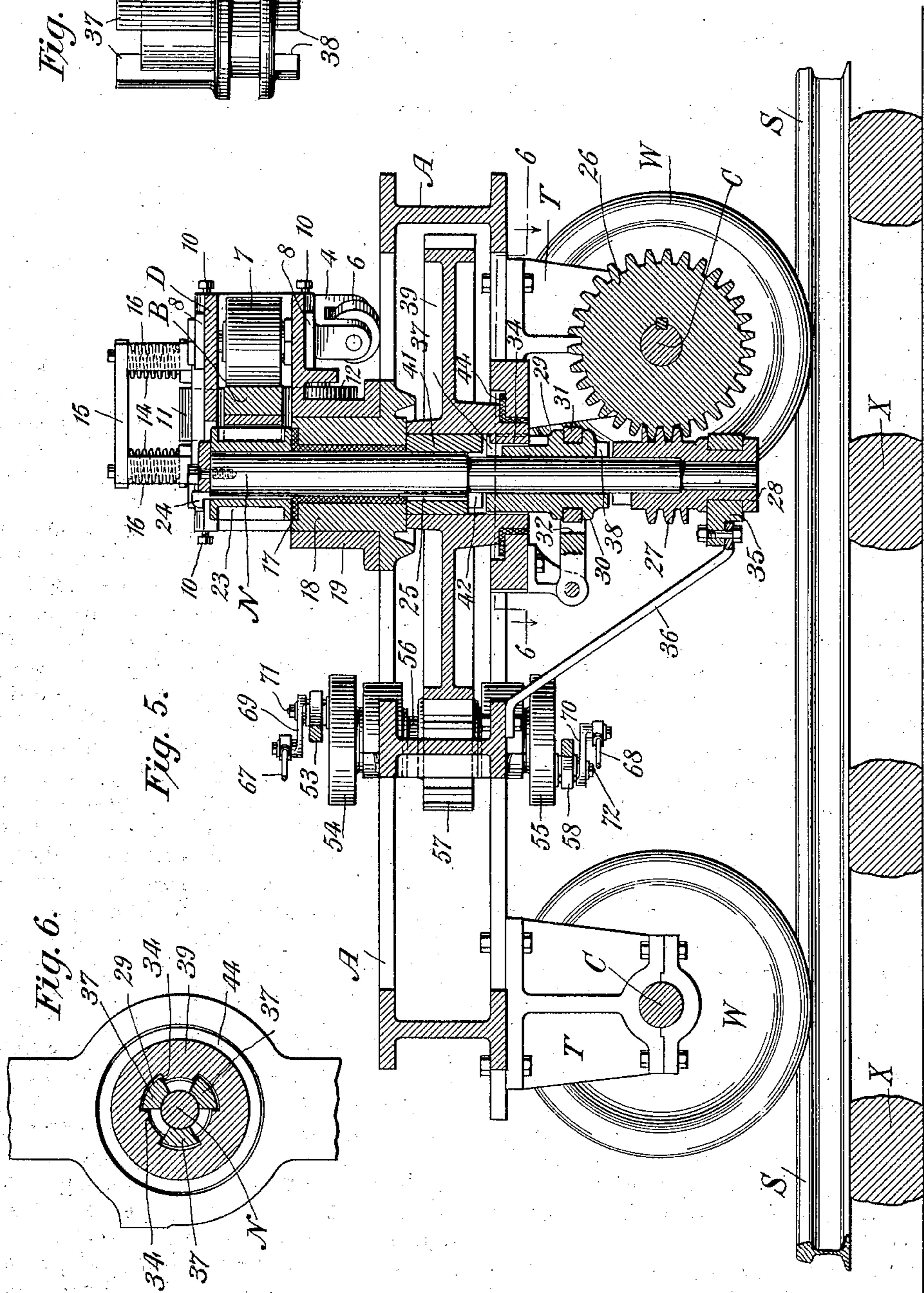
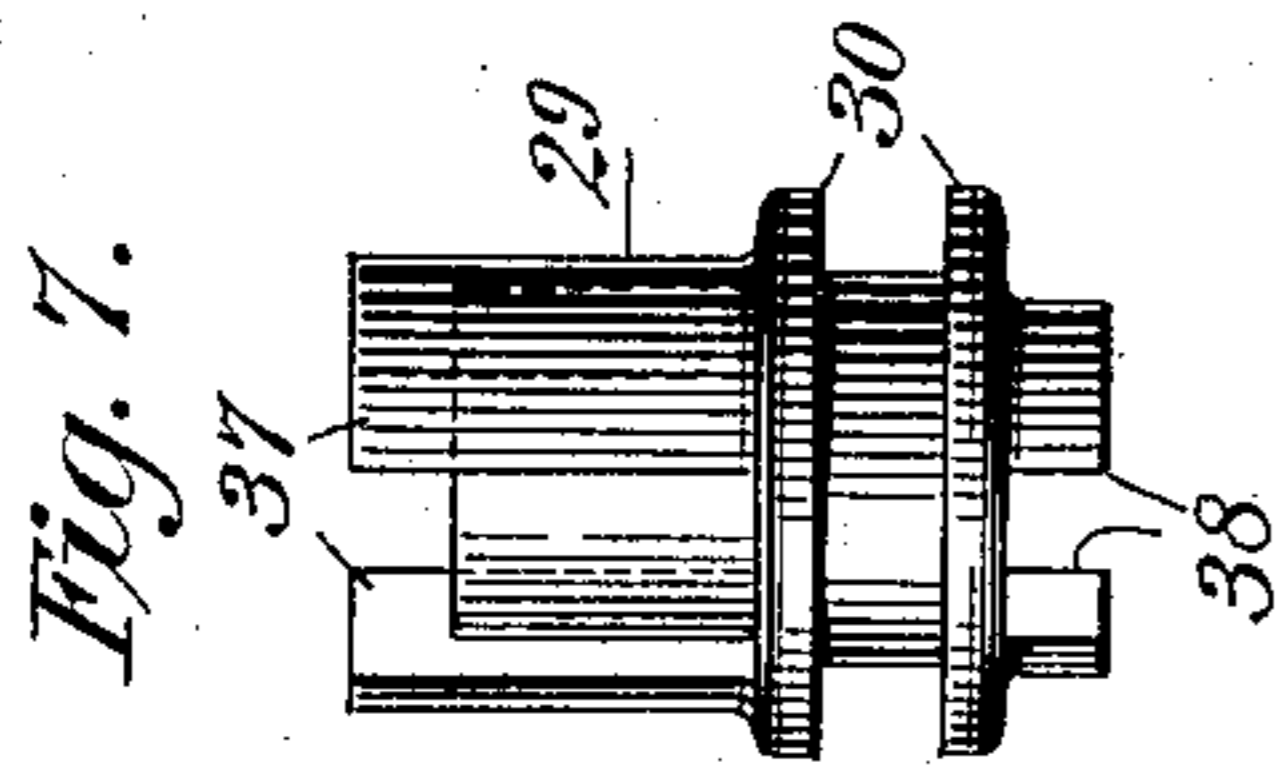
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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

WILLIAM H. McCONNELL, OF COVINGTON, VIRGINIA, ASSIGNOR TO COVINGTON MACHINE COMPANY, A CORPORATION OF VIRGINIA.

COKE-EXTRACTOR.

SPECIFICATION forming part of Letters Patent No. 768,067, dated August 23, 1904.

Application filed March 29, 1904. Serial No. 200,543. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. McCONNELL, a citizen of the United States, and a resident of Covington, in the county of Alleghany and State of Virginia, have invented a new and useful Improvement in Coke-Extractors, of which the following is a specification.

My invention relates to improvements in machinery for the extraction of coke from coke-ovens, and particularly that class of machine in which a plate or shovel is forced through the door of the oven and under the coke, and then withdrawing it either by pushing it out of a door on the opposite side of the oven or else by carrying it out of the door, through which the tool or shovel is inserted by the withdrawal of the same.

It relates particularly to that class of machinery in which the tool which removes the coke from the oven is carried upon a carriage moving on a track in front of a series of ovens, and which carriage by means of appropriate mechanism is caused to travel in front of the ovens, and by further appropriate mechanism to insert and withdraw the tool and so move it horizontally and vertically that all parts of the oven in succession will be subjected to its effect.

Heretofore various machines have been invented for producing the above-indicated objects; but most of them have been so expensive in working and so complicated in their respective parts that they have not been found in practice satisfactory; and the ultimate object of my invention is to construct a simply automatically operating machine possessing all of the above-indicated features, which will be simpler and less liable to get out of order.

The invention will be best understood by reference to the accompanying five sheets of drawings, forming a part of this specification, in which—

Figure 1 is a plan view of the machine. Fig. 2 is a vertical elevation of the machine as seen from the right-hand side of Fig. 1. Fig. 3 is a vertical end view of the machine. Fig. 4 is a vertical cross-section of the machine on the lines 4 4, Fig. 1; and Fig. 5 is a vertical cross-section of the machine in the

other direction on the lines 5 5, Fig. 1. Fig. 6 is a sectional view on the lines 6 6, Fig. 5.

Similar characters refer to similar parts throughout the several views.

In the drawings, A represents the bed-plate, which is made rectangular in form, as shown in Figs. 1 and 4. This is mounted upon four pedestals T, which in turn are mounted upon four wheels W on axles C.

S represents the rails upon which the extractor moves, placed in front of the series of furnaces upon the ties X X.

B is the bar or ram of the coke-removing tool, attached to which at one end is a scoop or shovel E by means of the angle-irons 1 1 and bolted to the bar B by the bolts 2 2, as shown in Figs. 1, 3, and 4. The ram B is mounted upon a horizontally-rotating ram-carriage D, which consists of a solid casting and which is best shown by reference to Figs. 1, 2, and 3. This terminates at either end in two extension-pieces 3 3, Fig. 2, to which are bolted at either end the uprights 4 4, attached by the bolts 5 5, on which they may be raised and lowered, and thus adjusted. The uprights 4 4 are forked at the base, as shown in Figs. 2, 3, and 5, and in the forks are placed rollers 6 6, two at either end, upon which the ram-carriage rotates upon the upper surface of the bed-plate A, as shown in Figs. 2, 3, and 5. The ram B is arranged to slide in the ram-carriage D, between, on a series of six vertical rollers 7, which rotate on bearing-boxes inserted in the top and bottom plates 8 8 of the ram-carriage D, as shown in Figs. 1, 3, 4, and 5. The position of the rollers 7 in the walls of the ram-carriage may be shifted from time to time by means of the sliding boxes 9, which are controlled by the screws 10, by moving the boxes laterally in and out, thus adjusting the position of the ram in the carriage. The ram is supported underneath at either end by two horizontal rollers 12 12, (shown in Fig. 4,) which are supported in the extension-pieces 3 3, and is held in place on top by two rollers 11 11, also at either end, placed on top of it. The front roller 11 is supported upon spring-bearings 14 at either end, held between a plate 13, extending out-

ward from the extension-pieces 3, of which it is a part, as shown in Figs. 1 and 3, and a plate 15 by the uprights 16, the object of this construction being to prevent the mechanism from breaking in the event of the scoop E of the ram B hitting any object which causes it to spring up quickly. The ram-carriage D is provided at its base with the flanged sleeve 19, formed integrally with the bottom plate 8, and is arranged to rotate on the sleeve 18, formed in a solid piece with the bed-plate. The sleeve 18 carries also four horizontal webs or arms 20, in which are held two rollers 21 21, similar to the rollers 11, which further serve to support the ram B. On one side of the ram B is formed a tooth-rack, as shown in Figs. 1, 3, and 4, provided with the teeth 22.

The mechanism which drives the ram B in and out of the ovens consists of a shaft N, which carries at its top a spur-wheel 23, keyed thereto by the key 24, which engages with the teeth upon the tooth-rack upon the ram. Shaft N rotates in a bushing 17, within the bearing 18, as shown in Fig. 5, and is surrounded at its lower end by a sleeve 41, which is keyed to it, which sleeve is provided at its lower end with jaws 42, which are arranged to mesh into the jaws of the clutch 29. Shaft N is solid throughout its length. The rack-pinion 23 and the sleeve 41, which has jaws 42 on its lower end, are keyed to shaft N. The engine-driven pinion 57 drives the gear-wheel 39, which revolves loosely on the sleeve 41. The gear-wheel 39 is provided with interior jaws on the lower part of its hub, which are always in engagement with corresponding jaws in the clutch 29. The clutch 29 revolves loosely on the shaft N. When it is desired to drive the ram B back and forward by means of its rack 22 and pinion 23, the clutch is thrown upward by forked lever 32 engaging pins in the loose ring 31 in the clutch 29. The upper jaws of the clutch 29 engage jaws 42 in the keyed sleeve 41, and also the interior jaws of the gear-wheel 39. The motion of the gear-wheel 39 is at once transferred to the shaft N, the pinion 23, and the rack 22, and the ram is driven as desired.

When it becomes necessary to move the machine from one oven to another, the clutch 29 is thrown downward, and its lower jaws engage with jaws on the worm-collar 28, loosely rotating on the shaft N. As the upper jaws of the clutch 29 are still in engagement with the interior jaws on the gear-wheel 39, the movement of that wheel is imparted to the worm 27, which turns the worm-wheel 26, keyed to the shaft C of wheels W.

In order to move the ram D in and out of the oven, as well as to move the extractor from one oven to another, two engines F and F' are employed, placed one above and the other below the bed-plate A, as shown in Figs. 2 and 3. The piston-rod 50 of the engine F terminates in the cross-head 51, as

shown in Fig. 1, which slides between the parallel bearings 52, as shown in Figs. 1 and 3. The cross-head 51 is attached to a connecting-rod 53, the other end of which is eccentrically coupled to the upper of the two disks 54 and 55, Figs. 1, 3, and 5, which are connected by a shaft 56, as shown in Fig. 5, rotating in suitable bearings in the bed-plate A and carrying a pinion-wheel 57, which engages with the pinion 39, which continues to rotate while the engine is being operated in a given direction. The lower engine F' is coupled in precisely the same way to the disk 55 on the lower end of the shaft 56 by means of the connecting-rod 58, terminating in a cross-head similar to the cross-head 51 and sliding between the bearings 59, as shown in Fig. 3, which bearings are similar to the bearings 52, and the cross-head being in turn connected with the piston-rod 60 of the engine F', as shown in Fig. 3. The connecting-rods 53 and 58 are so connected with the disks 54 and 55 that both engines will rotate the gear-wheel 39 in the same direction, and hence its movement will depend upon the manner of the admission of the impelling medium to the two engines. The valve-controlling gear, which controls the ingress and egress of the impelling medium to the two engines, is shown in Figs. 1 and 3, and consists of the valve-rods 61 and 62 sliding in the valve-chests, which are connected with sliding cross-heads 63 and 64, sliding in the bearings 65 and 66 on the outside of the bearings 52 and 59, respectively, which are actuated by the connecting-rods 67 and 68, which are attached to eccentric couplings 69 and 70 on the pin 71 and 72, which attach connecting-rods 53 and 58 to the disks 54 and 55. Any other mechanism for actuating the valves of the engines may be employed without reference to particular construction, as the same is no part of the essence of the present invention.

For the purpose of moving the carriage D upon the table A around the sleeve 18, on which it turns, a screw-lever is provided passing through a suitable bearing 74, placed upon the rear end of the carriage D and supported by a suitable bearing 75 on a bracket 76 upon the bed-plate, as shown in Figs. 1 and 3. The outer end of this rod 73 is provided with a hand-wheel H, by turning which the rod revolves, and the screw-thread on the other end of it rotating in an appropriate thread in a block pivoted in the bearing 74 causes the carriage D to turn upon the sleeve 18.

For the purpose of controlling the admission of impelling medium to the engines F and F' a valve-chamber 77 is provided, into which the supply-pipe 78 enters, as shown in Fig. 1. From this chamber, pipe 79 and 80 conduct the impelling medium to the two engines, and by means of the lever 81 the direction of the impelling medium in the chamber 77 may be reversed. The movement is imparted laterally

from the gear-wheel 39 to the shaft N, first, for the purpose of moving the arm B, and, second, for the purpose of moving the coke-extractor on the track by means of a clutch 29, which surrounds the shaft N and is of the form shown in Figs. 6 and 7. Either end of this clutch is provided with jaws, as shown in Figs. 5, 6, and 7. The upper jaws are arranged to engage with appropriate jaws upon the interior of the hub of the gear-wheel 39, so that when the clutch moves upward and the jaws engage, the motion of the gear-wheel being imparted to the keyed sleeve 41 causes the shaft N to rotate and the arm B to be reciprocally moved in and out of the furnace, according to the direction of the movement imparted to the wheel 39. The two flanges 30 are formed on the clutch, as shown in Figs. 5 and 7, and in them is placed a ring 31, which ring is actuated by a forked lever 32 engaging therewith, as shown. The clutch can revolve loosely in the ring, and by raising the lever the ring and the clutch will be moved up and down. On the shaft below the clutch, rotating in bearing 35, is a hollow sleeve 28, carrying a worm-gear 27, which is arranged to engage with a gear-wheel 26 on the forward axle C of the carriage. The worm-gear 28 is supported in a bearing in a stirrup composed of two arms 33, attached to the lower surface of the bed-plate A, as shown in Figs. 3 and 4, in which the shaft rotates on the collar 35. The sleeve 28 runs loose upon the shaft N, and when the clutch 29 is thrown down the jaws become locked and the movement of wheel 39 is imparted to the sleeve 28. The clutch 29 is raised and lowered by means of the lever 82, as shown in Figs. 1 and 2, and by throwing the lever forward or backward the clutch 29 is alternately caused to engage with the sleeve 28 or the collar 41.

The method of operation is as follows: When it is desired to move the extractor from one operation to the other, the lever 82 is drawn forward, whereupon the clutch 29 engages with the sleeve 28. The lever 81 is then moved, and impelling medium being admitted to the engines causes the extractor to move in the direction desired, whereupon the pinion 39 will begin to rotate. The lever 82 is thrown forward, causing the clutch 29 to engage with the sleeve 28, thus causing the motion of the pinion 39 to be imparted through the clutch to the sleeve 28. This in turn will impart its motion to the gear-wheel 26, which in turn, through the sprocket-wheels 83 83 and chain 84, will impart motion to the other axle of the extractor, and the extractor will move forward. When the appropriate point is reached, the lever 82 is thrown back and clutch 29 is thrown out of engagement with the sleeve 28, whereupon the extractor will stop, and by throwing the lever 82 still farther back the clutch 29 will engage at its upper end with the sleeve 41, thus causing the

shaft N to rotate and impart its movement to the ram B, thereby causing the same to move in and out of the furnace. By turning the wheel H the angularity of the ram with respect to the extractor may be changed any desired angle to draw the coke from the jambs of the furnace.

I claim as my invention—

1. In a coke-extractor, the combination of a ram-carriage arranged to rotate on suitable rollers on the bed-plate of the machine; a suitable bearing attached to the bed-plate around which the carriage rotates, a driving-shaft passing through and rotating in said bearing, a ram sliding in the carriage actuated by the rotation of the shaft; suitable vertical guiding-rollers in the carriage for guiding the horizontal movement of the ram in the carriage; horizontal rollers at either end of the carriage for guiding the vertical movement of the ram; and devices substantially as described whereby the ram-carriage and ram are rotated on the bed-plate.

2. In a coke-extractor, the combination of a ram-carriage arranged to rotate on suitable rollers on the bed-plate of the machine; a suitable bearing attached to the bed-plate around which the carriage rotates, a driving-shaft passing through and rotating in said bearing, a ram sliding in the carriage actuated by the rotation of the shaft; suitable vertical guiding-rollers in the carriage for guiding the horizontal movement of the ram in the carriage; horizontal rollers at either end of the carriage for guiding the vertical movement of the ram, and a shaft carrying a hand-wheel at one end and provided at the other end with a worm-gear engaging with a corresponding gear in a bearing on the ram-carriage whereby the ram-carriage and ram are rotated on the bed-plate.

3. In a coke-extractor, the combination of a ram-carriage arranged to rotate on suitable rollers on the bed-plate of the machine, a suitable bearing attached to the bed-plate around which the carriage rotates, a driving-shaft passing through and rotating in said bearing, a ram sliding in the carriage actuated by the rotation of the shaft; suitable vertical guiding-rollers placed in adjustable bearings in the carriage, for guiding the horizontal movement of the ram in the carriage; horizontal rollers at either end of the carriage for guiding the vertical movement of the ram; and a shaft carrying a hand-wheel at one end and provided at the other end with a worm-gear engaging with a corresponding gear in a bearing on the ram-carriage whereby the ram-carriage and ram are rotated on the bed-plate.

4. In a coke-extractor, the combination of a ram-carriage arranged to rotate on suitable rollers on the bed-plate of the machine; a suitable bearing attached to the bed-plate around which the carriage rotates, a driving-shaft passing through and rotating in said bearing, a ram sliding in the carriage actuated by the

rotation of the shaft suitable vertical guiding-rollers in the carriage for guiding the horizontal movement of the ram in the carriage; horizontal rollers at either end of the carriage
 5 for guiding the vertical movement of the ram, the upper forward of which is mounted on spring-bearings and a shaft carrying a hand-wheel at one end and provided at the other end with a worm-gear engaging with a corresponding gear in a bearing on the ram-carriage, whereby the ram-carriage and ram are rotated on the bed-plate.

5. In a coke-extractor, the combination of a ram-carriage composed of a solid casting arranged to rotate on suitable rollers on the bed-plate of the machine; a suitable bearing attached to the bed-plate around which the carriage rotates; a ram provided with a toothed rack on one side sliding on suitable guiding-rollers in the carriage; a driving-shaft passing through and rotating in said bearing carrying a spur-wheel engaging in the rack, a sleeve rotating with the shaft, provided with suitable clutch-jaws at its lower end; a constantly-rotating pinion driven from a suitable source of power rotating loosely around the sleeve; a sliding clutch placed on the shaft below the sleeve, and rotating with the same, provided on its upper face with jaws arranged
 30 to engage with the clutch-jaws of the sleeve; and devices substantially as described for causing the clutch-jaws to engage with the sleeve whereby the motion of the gear-wheel is imparted through the shaft and spur-wheel to the
 35 ram.

6. In a coke-extractor, the combination substantially as described, of a ram-carriage arranged to rotate on a bearing in the bed-plate of the machine; a ram provided with a toothed
 40 rack on one side, sliding on suitable supports in the carriage; a driving-shaft carrying a gear-wheel at its upper end, engaging with the toothed rack on the ram; a sleeve rotating with the shaft provided with suitable clutch-jaws at its lower end; a constantly-rotating pinion driven from a suitable source of power, rotating around the sleeve; a second sleeve provided at its upper end with clutch-jaws and carrying a worm-gear on its outer
 50 surface, arranged to rotate loosely on the lower end of the shaft; a sliding clutch surrounding the shaft provided at either end, with clutch-jaws arranged to engage alternately with the jaws of the upper sleeve and
 55 lower sleeve; a gear-wheel on one of the axles of the carriage arranged to engage with the worm-gear, and devices substantially as described for causing the sliding clutch to engage alternately with the sleeves whereby the
 60 motion of the rotating pinion is imparted through the shaft to the carriage, or to the ram as may be desired, by the movement of the controlling devices.

7. In a coke-extractor, the combination substantially as described, of a ram-carriage ar-

ranged to rotate on a bearing in the bed-plate of the machine; a ram provided with a toothed rack on one side, sliding on suitable supports in the carriage; a driving-shaft carrying a gear-wheel at its upper end, engaging with
 70 the toothed rack on the ram; a sleeve rotating with the shaft provided with suitable clutch-jaws at its lower end; a constantly-rotating pinion driven from a suitable source of power, rotating around the sleeve; a second
 75 sleeve provided at its upper end with clutch-jaws and carrying a worm-gear on its outer surface arranged to rotate loosely on the lower end of the shaft; a sliding clutch surrounding the shaft provided at either end,
 80 with clutch-jaws arranged to engage alternately with the jaws of the upper sleeve and lower sleeve; a gear-wheel on one of the axles of the carriage arranged to engage with the worm-gear, and a lever for causing the sliding clutch to engage alternately with the
 85 sleeves whereby the motion of the pinion is imparted through the shaft to the carriage or to the ram as may be desired.

8. In a coke-extractor, the combination substantially as described, of a ram-carriage arranged to rotate on a bearing in the bed-plate of the machine; a ram provided with a toothed rack on one side, sliding on suitable supports in the carriage; a driving-shaft passing
 95 through the ram-carriage bearing carrying a gear-wheel at its upper end, engaging with the toothed rack on the ram; a sleeve rotating with the shaft provided with suitable clutch-jaws at its lower end; a constantly-rotating pinion driven from a suitable source of power rotating around the sleeve; a second sleeve provided at its upper end with clutch-jaws and carrying a worm-gear on its outer
 100 surface arranged to rotate loosely on the lower end of the shaft; a sliding clutch surrounding the shaft provided at either end, with clutch-jaws arranged to engage alternately with the jaws of the upper sleeve and
 105 lower sleeve; a gear-wheel on one of the axles of the carriage arranged to engage with the worm-gear, and a forked lever actuating a ring attached to the clutch for causing the latter by the reversal of the lever to engage alternately with the sleeves, whereby the motion of the pinion is imparted through the
 110 shaft to the carriage or to the ram as may be desired.

9. In a coke-extractor the combination of a ram-carriage composed of a solid casting arranged to rotate on suitable rollers on the bed-plate of the machine; a suitable bearing attached to the bed-plate, around which the ram-carriage rotates; a ram provided with a toothed
 120 rack on one side sliding on suitable guiding-rollers in the carriage, a driving-shaft passing through and rotating in said bearing carrying a spur-wheel engaging in the rack; a sleeve rotating with the shaft, provided with suitable clutch-jaws at its lower end; a constantly-
 130

rotating pinion rotating loosely around the sleeve; a sliding clutch on the shaft below the sleeve, and rotating with the same, provided on its upper face with jaws arranged to engage
 5 with the clutch-jaws of the sleeve; devices substantially as described for causing the clutch-jaws to engage with the sleeve whereby the motion of the gear-wheel is imparted through the shaft and spur-wheel to the ram; two en-
 10 gines placed vertically one upon the other on the bed-plate; a suitable pinion attached to and rotating with a suitable shaft rotating in bearings on the bed-plate arranged to rotate with and impart its motion to the pinion on the
 15 sleeve and connecting-rods so coupled to the pinion-shaft and to the piston-rods of the engine that both engines will rotate the pinion on the driving-shaft in one direction, and on being reversed rotate it in the reverse direc-
 20 tion, and suitable valves whereby the impelling medium may be admitted to the two engines at appropriate times, and suitable devices for controlling the admission of the im-
 25 pelling medium to the engines.

10. In a coke-extractor the combination of a ram-carriage composed of a solid casting arranged to rotate on suitable rollers on the bed-plate of the machine; a suitable bearing at-
 30 tached to the bed-plate, around which the ram-carriage rotates; a ram provided with a toothed rack on one side sliding on suitable guiding-rollers in the carriage, a driving-shaft pass-
 35 ing through and rotating in said bearing carrying a spur-wheel engaging in the rack; a sleeve rotating with the shaft, provided with suitable clutch-jaws at its lower end; a constantly-rotating pinion rotating loosely around
 40 the sleeve; a sliding clutch on the shaft below the sleeve, and rotating with the same, provided on its upper face with jaws arranged to engage with the clutch-jaws of the sleeve; de-
 45 vices substantially as described for causing the clutch-jaws to engage with the sleeve whereby the motion of the gear-wheel is imparted through the shaft and spur-wheel to the ram; two engines placed vertically one upon the
 50 other on the bed-plate; a suitable pinion attached to and rotating with a suitable shaft rotating in bearings on the bed-plate arranged to rotate with and impart its motion to the pinion on the sleeve and connecting-rods cou-
 55 pled at an appropriate angle to the pinion-shaft at one end and to the piston-rods of the engines at the other and that both engines will rotate the pinion on the driving-shaft in one direction, and on being reversed rotate it in the reverse direction, and suitable valves whereby the impelling medium may be ad-
 60 mitted to the two engines at appropriate times, and suitable devices for controlling the admission of the impelling medium to the engines.

11. In a coke-extractor the combination of a ram-carriage composed of a solid casting ar-
 65 ranged to rotate on suitable rollers on the bed-

plate of the machine; a suitable bed-plate at-
 70 tached to the bed-plate around which the carriage rotates; a ram provided with a toothed rack on one side sliding on suitable guiding-rollers in the carriage, a driving-shaft pass-
 75 ing through and rotating in said bearing carrying a spur-wheel engaging in the rack; a sleeve rotating with the shaft, provided with suitable clutch-jaws at its lower end; a constantly-rotating pinion rotating loosely
 80 around the sleeve; a sliding clutch on the shaft below the sleeve, and rotating with the same, provided on its upper face with jaws arranged to engage with the clutch-jaws of the sleeve; a second sleeve provided at its up-
 85 per end with clutch-jaws, and carrying a worm-gear on its outer surface arranged to rotate loosely on the lower end of the shaft, a sliding clutch surrounding the shaft provided at either end with clutch-jaws arranged to en-
 90 gage with the jaws of the upper and lower sleeves; two engines placed vertically one upon the other on the bed-plate; a suitable pinion attached to and rotating with a suitable shaft rotating in bearings on the bed-plate
 95 arranged to rotate with and impart its motion to the pinion on the sleeve; connecting-rods so coupled to the pinion-shaft and to the piston-rods of the engine that both engines will rotate the pinion on the driving-shaft in one
 100 direction, and on being reversed rotate it in the reverse direction, suitable valves whereby the impelling medium may be admitted to the two engines at appropriate times, suitable devices for controlling the admission of
 105 the impelling medium to the engines, and devices substantially as described for causing the sliding clutch to engage alternately with the sleeves whereby the motion of the pinion is imparted through the shaft to the carriage
 110 or to the ram as may be desired by the movement of the controlling devices.

12. In a coke-extractor, the combination of a bed-plate carried upon a pair of suitable axles, each terminating in wheels arranged to move
 115 on a suitable track; a sprocket-wheel on the exterior of each of the axles; a chain connecting the same whereby the movement of one axle is imparted to the other; a ram-carriage arranged to rotate on suitable rollers on the
 120 bed-plate; a suitable bearing on the bed-plate around which the ram-carriage turns; a ram provided with a toothed rack on one side sliding on suitable guiding-rollers in the carriage; a driving-shaft passing through and rotating
 125 in said bearing carrying a spur-wheel engaging in the rack; a sleeve rotating with the shaft provided with suitable clutch-jaws at its lower end; a constantly-rotating pinion rotating loosely around the sleeve; a sliding clutch on
 130 the shaft below the sleeve and rotating with the same, provided on its upper face with jaws arranged to engage with the clutch of the sleeve; a second sleeve provided at its upper end with clutch-jaws and carrying a worm-

gear on its outer surface arranged to rotate loosely on the lower end of the shaft; a gear-wheel on one of the axles whereby the motion of the worm-gear is imparted to the axle and thence to the extractor; a sliding clutch surrounding the shaft, provided at either end with clutch-jaws arranged to engage the jaws of the upper and lower sleeves, and devices substantially as described for causing the clutch to engage alternately with the sleeves, whereby the motion of the constantly-rotating pinion is imparted either through the shaft to the carriage and is caused to move over the track, or to the ram and it is caused to move in and out of the coke-oven as may be desired.

13. In a coke-extractor, the combination of a bed-plate carried upon a pair of suitable axles, each terminating in wheels arranged to move on a suitable track; a sprocket-wheel on the exterior of each of the axles; a chain connecting the same whereby the movement of one axle is imparted to the other; a ram-carriage arranged to rotate on suitable rollers on the bed-plate; a suitable bearing on the bed-plate around which the ram-carriage turns; a ram provided with a toothed rack on one side sliding on suitable guiding-rollers in the carriage; a driving-shaft passing through and rotating in said bearing carrying a spur-wheel engaging in the rack; a sleeve rotating with the shaft provided with suitable clutch-jaws at its lower end; a constantly-rotating pinion rotating loosely around the sleeve; a sliding clutch on the shaft below the sleeve and rotating with the same, provided on its upper face with jaws arranged to engage with the clutch of the sleeve; a second sleeve pro-

vided at its upper end with clutch-jaws and carrying a worm-gear on its outer surface arranged to rotate loosely on the lower end of the shaft; a gear-wheel on one of the axles whereby the motion of the worm-gear is imparted to the axle and thence to the extractor; a sliding clutch surrounding the shaft, provided at either end with clutch-jaws arranged to engage the jaws of the upper and lower sleeves, a driving-pinion mounted upon a suitable shaft engaging with the pinion rotating on the sleeve; two engines placed vertically above one another and connecting-rods so coupled to the pinion-shaft and to the piston-rods of the engines, that both engines will rotate the pinion on the driving-shaft in one direction, and on being reversed rotate it in the reverse direction, and suitable valves whereby the impelling medium may be admitted to the two engines at appropriate times, and suitable devices for controlling the admission of the impelling medium to the engine, and devices substantially as described for causing the clutch to engage alternately with the sleeves, whereby the motion of the constantly-rotating pinion is imparted either through the shaft to the carriage and is caused to move over the track, or to the ram and it is caused to move in and out of the coke-oven as may be desired.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 28th day of March, 1904.

WILLIAM H. McCONNELL.

Witnesses:

SANFORD ROBINSON,
WILLARD PARKER BUTLER.