

(No Model.)

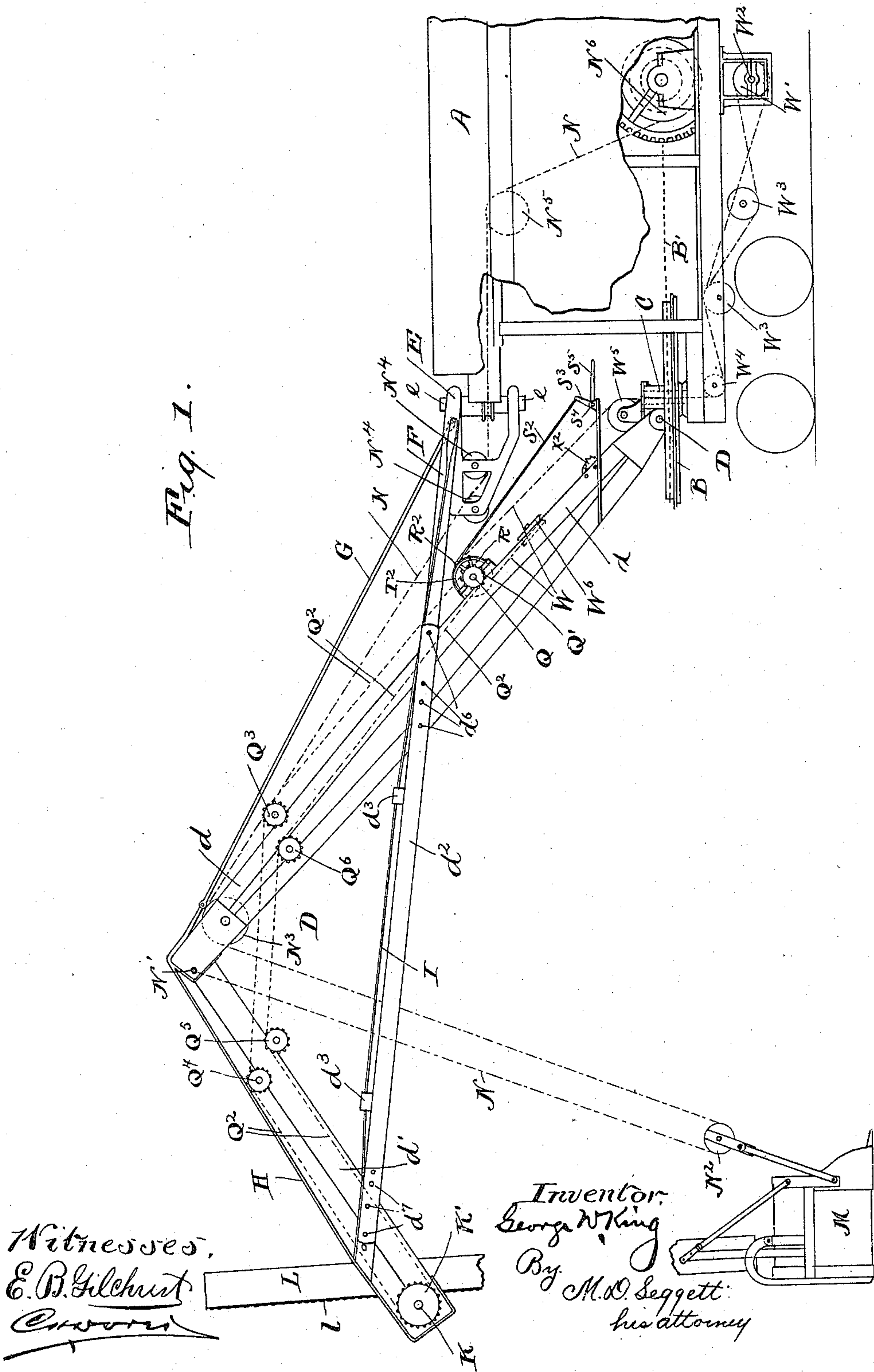
3 Sheets—Sheet 1.

G. W. KING.
STEAM SHOVEL OR EXCAVATOR.

No. 579,589.

Patented Mar. 30. 1897.

Fig. 1.



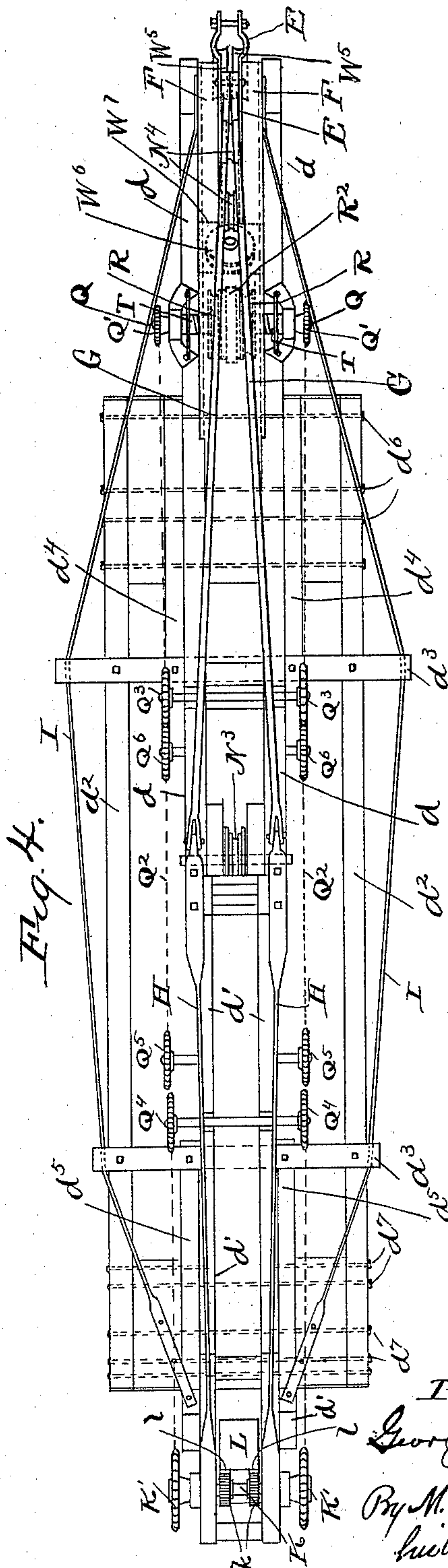
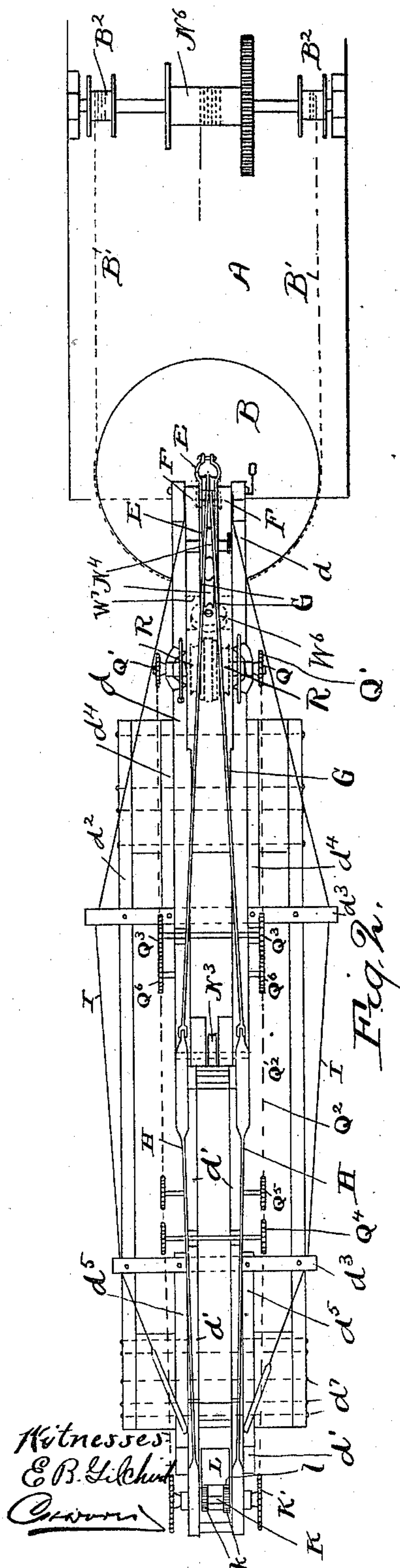
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By M. D. Seggett
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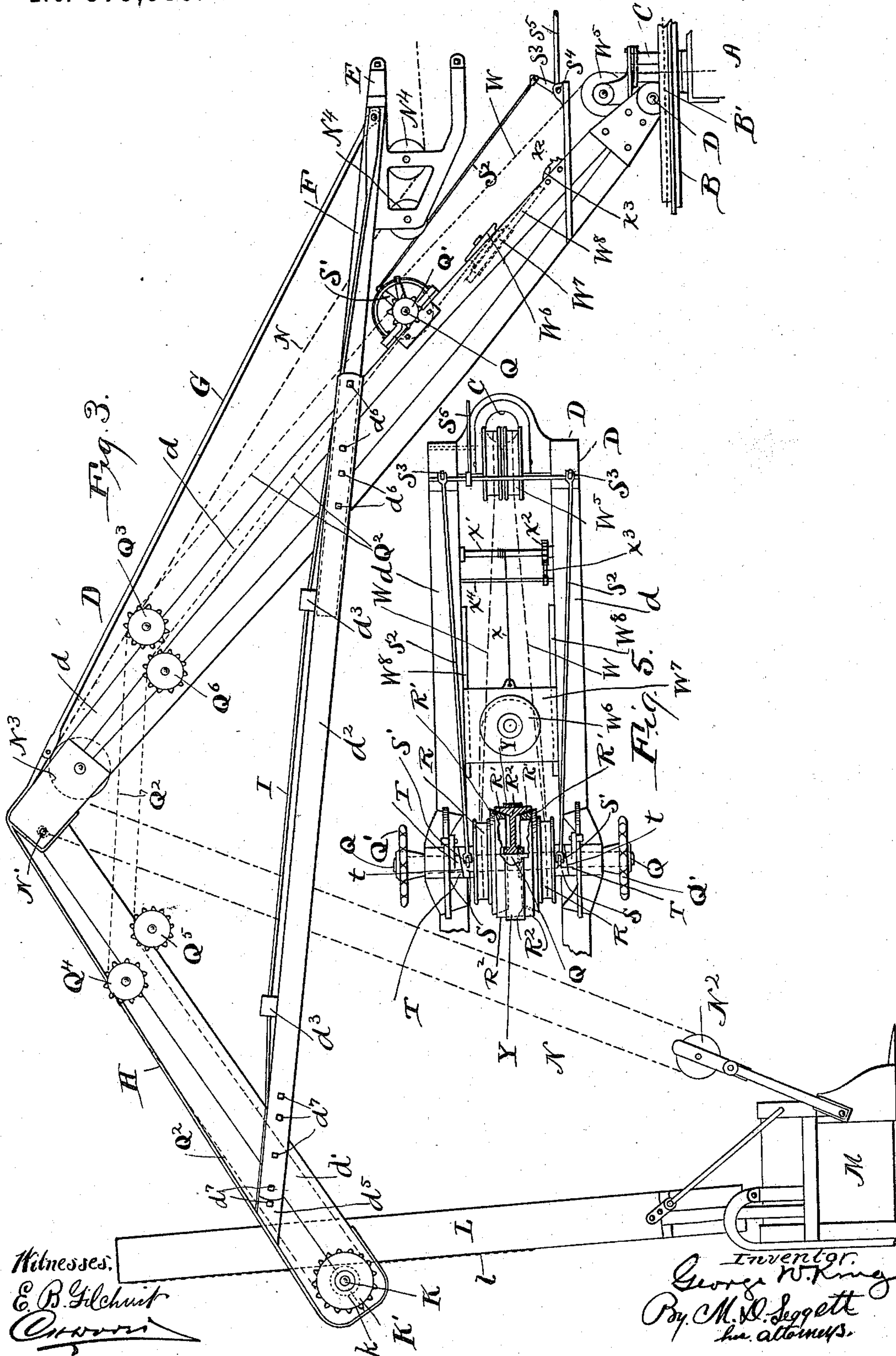
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STEAM SHOVEL OR EXCAVATOR.

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Patented Mar. 30, 1897.



UNITED STATES PATENT OFFICE.

GEORGE W. KING, OF MARION, OHIO.

STEAM SHOVEL OR EXCAVATOR.

SPECIFICATION forming part of Letters Patent No. 579,589, dated March 30, 1897.

Application filed July 18, 1894. Serial No. 517,871. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. KING, of Marion, in the county of Marion and State of Ohio, have invented certain new and useful
5 Improvements in Steam Shovels or Excavators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use
10 the same.

My invention relates to improvements in steam shovels or excavators, the primary object being to provide a back-acting steam shovel or excavator—that is, a machine where-
15 in the shovel, instead of being thrust from the car of the machine in digging or taking up a load, is moved toward the machine, whereby the machine is particularly well adapted where the surface of the place re-
20 quiring excavation consists of a thin strata of rock or solid material and where the material under said solid strata is too soft to carry the weight of the machine and where-
25 ever—as, for instance, in digging sewers and other narrow trenches—it is desirable to have the machine travel on the solid ground or strata in advance of the work.

With this object in view and in order to place the dipper or shovel proper of the ma-
30 chine under the full control of the operator by providing a construction wherein the dipper or shovel proper can be raised or lowered and thrust in or out at the will of the opera-
35 tor and to the end of attaining certain other advantages hereinafter specified my invention consists in certain features of construction and in combinations of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is
40 a side elevation of a machine embodying my invention, portions being broken away to more clearly show the construction. Fig. 2 is a top plan of a portion of the machine. Fig. 3 is a side elevation of the boom or crane
45 that carries the shovel proper or dipper of the machine, and Fig. 4 is a top plan relative to Fig. 3. Fig. 5 is a view in detail, hereinafter referred to.

Referring to the drawings, A represents the
50 car or body portion of the machine, the same at its forward end being provided with a turn-
table B, that is mounted on an upright hol-

low shaft C. A boom or crane D is suitably secured to the turn-table, as at D', in any approved manner, the boom or crane being
55 preferably of the following construction: Two beams $d\ d$, (see Fig. 4,) located a suitable interval apart, extend upwardly and outwardly from the connection of the boom or crane
60 with the aforesaid turn-table. Said beams extend, preferably, somewhat beyond the central portion of the crane or boom and have secured thereto at their outer ends two down-
65 wardly and outwardly extending beams $d' d'$, that are also located a suitable interval apart. The two beams $d' d'$ and also the two beams or members $d\ d$ are tied together and braced
70 apart in any suitable manner. To the outer side of each beam or member d' , between the central portion and outer end of the respec-
75 tive beam, is secured an approximately horizontally-arranged beam or member d^2 . Beams or members d^2 extend from beams or members d' to beams or members d , and are se-
80 cured to the outer side and preferably at or near the central portion of said beams d . The two cross bars or beams are located such a
85 distance apart as to accommodate the raising of the shovel proper or dipper of the machine upwardly between them. The two beams or
80 members d^2 at one or more points between beams or members d and d' are tied together by transversely-arranged beams or timbers d^3 .
85 In the construction illustrated two transversely-arranged beams or timbers d^3 are provided, and these are located a suitable interval
90 apart to accommodate the operation of the shovel proper or dipper of the machine, the inner beam or timber d^3 being secured to longi-
95 tudinally-arranged beams or timbers d^4 , that in turn are suitably secured to beams or members d , and the outer transversely-arranged member d^3 being suitably secured to longitudi-
nally-arranged beams or timbers d^5 , that in turn are suitably secured to beams or mem-
95 bers d' . Members $d\ d$, $d^2 d^2$, and $d^4 d^4$ are preferably secured together by assembling-bolts d^6 , and members $d' d'$, $d^2 d^2$, and $d^5 d^5$ are in like
100 manner preferably secured together by assembling-bolts d^7 , as shown in Figs. 3 and 4. By the construction hereinbefore described it will
be observed that members $d\ d$, $d' d'$, and $d^2 d^2$ in side elevation, as shown very clearly in Fig. 3, form an A-shaped structure. The boom or

crane is also suitably supported from the top portion of the forward end or body portion of the machine, a preferable construction consisting in securing the boom or crane to a bracket E, (see Fig. 1,) that is pivotally supported, as at *e*, from the body portion of the machine in such a manner as to accommodate the swinging of the crane or boom in a horizontal plane, the A-shaped structure of the boom or crane being preferably connected with said bracket by means of beams or timbers F, that are suitably secured at opposite ends to beams or members *d d* and to the bracket, respectively. The A-shaped structure of the crane or boom is also preferably connected with bracket E by means of one or more tie-rods G, that extend, preferably, from the outer or upper ends of beams or members *d d* to the aforesaid bracket. Also the outer ends of beams or members *d' d'* of the A-shaped structure of the boom or crane are connected with the outer or upper ends of beams or members *d d* of said structure by means of one or more tie-rods H. Also one or more tie or truss rods I connect members *d' d'*, (or beams or members *d'*,) secured to members *d'*, together with the transversely-arranged members *d³ d³*, to bracket E, (or to the timbers F, secured to said brackets.)

Supported from and located at or near the outer or lower ends of members *d' d'* of the A-shaped structure of the boom or crane is a horizontal shaft K, upon which are operatively mounted two pinions *k k*, adapted to mesh with rack-bars *l l*, arranged longitudinally of and suitably secured to the arm L of the shovel proper or dipper M of the machine, beams or members *d' d'* of the A-shaped structure of the crane or boom being located a suitable interval apart to accommodate between them the location and operation of pinions *k* and the shovel or dipper arm. The rack-bars are arranged on the back side of the shovel or dipper arm, and the shovel or dipper is arranged to dig or excavate in the direction toward the body portion of the machine. Hence it will be observed that the car or body portion of my improved machine travels on the solid ground or surface in advance of the work.

Before proceeding to describe the apparatus whereby the shovel or dipper arm is thrust in or out in excavating I will describe the apparatus employed for swinging the shovel proper or dipper outwardly (or backing up the dipper) preparatory to digging or excavating, and inwardly, (or toward the body portion of the machine.) The apparatus employed for the purpose consists, preferably, of a continuous chain N, (see Fig. 1,) that at one end is secured to the upper portion of the framework of the boom or crane, preferably at or near the junction of beams or members *d d* with beams or members *d' d'* of the A-shaped structure of the crane or boom, as at N'. The chain leads from said point N' downwardly to and under a sheave or pulley

N², pivotally connected with the shovel proper or dipper, and thence returns and leads to and over a sheave or pulley N³, supported by the A-shaped structure of the boom or crane in suitable proximity to point N'. From sheave or pulley N³ chain N leads to sheaves or pulleys N⁴, carried by bracket E, thence leads in a horizontal or approximately horizontal plane over one or more sheaves or pulleys N⁵, carried by the top portion of the car or body portion of the machine, and thence leads downwardly to and over the winding-drum N⁶ (see also Fig. 2) on the body portion of the machine and supported and operated in any suitable manner. By the apparatus just described it will be observed that the shovel proper or dipper is swung in the direction to hoist the shovel proper or dipper upon actuating the winding drum to take up the chain or cable and that the shovel proper or dipper is lowered by the gravity of the same upon permitting said drum to rotate in the opposite direction.

The boom or crane is swung in a horizontal plane by means of turn-table B and a continuous chain B', engaging said table and attached at opposite ends to winding-drums B² B², respectively, the turn-table-actuating chain being paid out by the one drum while it is wound upon the other drum, and the turn-table being actuated in the one direction or the other according as the operating-chain is wound upon the one or the other winding-drum.

The apparatus employed for operating shaft K and the pinions upon said shaft, whereby said pinions are actuated to thrust the shovel or dipper in or out in excavating, is preferably as follows: Beams or members *d d*, preferably near their lower end, support a horizontally and transversely arranged shaft Q, (see Figs. 3, 4, and 5,) upon each end whereof is operatively mounted a sprocket-wheel Q', and sprocket-wheels Q' Q' are operatively connected by means of endless chain Q² Q² with sprocket-wheels K' K', operatively mounted upon shaft K.

Chains Q² Q², to avoid interference with the operation of the shovel proper or dipper, lead upwardly from sprocket-wheels Q' Q' to and over sprocket-wheels Q³ Q³, (see Fig. 3,) supported from and near the upper end of beams or members *d d* of the A-shaped structure of the boom or crane, thence in a horizontal or approximately horizontal plane to and over sprocket-wheels Q⁴ Q⁴, supported from and near the upper ends of members *d' d'*, thence to and over sprocket-wheels K' K', hereinbefore referred to, thence return and lead to and over sprocket-wheels Q⁵ Q⁵, located in suitable proximity to sprocket-wheels Q⁴ Q⁴, and thence lead to and over sprocket-wheels Q⁶ Q⁶, located in suitable proximity to sprocket-wheels Q³ Q³, whence they return to sprocket-wheels Q' Q' on shaft Q. By the construction and arrangement of parts just described it will be observed that

the shovel or dipper arm and consequently the shovel proper or dipper are thrust in or out according as shaft Q and consequently endless chains Q^2 Q^2 are actuated in the one direction or the other. The apparatus employed for rotating said shaft and enabling the latter to be actuated at pleasure in the one direction or the other is preferably as follows: Two pulleys R (see Fig. 5) are loosely mounted upon shaft Q a suitable interval apart. Said pulleys at their inner end carry, respectively, the one member R' of a clutch, the other members R^2 R^2 of the clutches being operatively mounted upon the shaft in any approved manner. I prefer the employment of friction-clutches, and members R' of said clutches, that, as already indicated, are rigid with pulleys R and are normally out of operative connection with the shaft, constitute the male members of said clutches, whereas members R^2 constitute the female members of the clutches and are preferably integral with each other. Upon shaft Q, at the outer end of each pulley R, are loosely mounted two collars S and T, respectively, the outer collars T being held stationary in any suitable manner.

The opposing ends or surfaces of contiguous collars S T are provided, respectively, with one or more inclines t , the arrangement and trend whereof are such that the adjacent clutch-member-bearing pulley, by turning the respective collar S in the one direction, is actuated to bring the clutch member carried thereby into frictional engagement with the companion clutch member and thereby establish operative connection between said pulley and the shaft, and when the members of the clutch are in operative connection with each other by turning collar S in the opposite direction the pulley bearing one of the clutch members is released or loosened. The arms S' of collars S are operatively connected by means of links S^2 (see Figs. 3 and 5) with arms or levers S^3 , operatively mounted upon a horizontal shaft S^4 , supported from that end of the framework of the crane or boom that is located adjacent to the turn-table G, and said shaft S^4 is provided with a hand-lever S^5 for operating the same, and the arrangement of parts is such that according as said lever is actuated to the one or the other of its extreme positions the one or the other of pulleys R R is operatively connected with shaft Q, and so that both pulleys are rendered free relative to the shaft by placing the hand-lever in a middle or intermediate position. Both pulleys R are operatively connected by means of an endless chain W with a pulley W' , (see Fig. 1,) that is operatively mounted upon a shaft W^2 , adapted to rotate continuously in one direction and located, preferably, near the central portion and below the floor of the body portion of the machine; but the operative connection is such that the two pulleys R are rotated in opposite directions, respectively, and so that shaft Q is rotated in the one direction

or the other, according as operative connection is established between the one or the other of said pulleys and the shaft. The endless chain leads from opposite sides of the pulley on the continuously-rotating shaft W^2 to and engages one or more sheaves or pulleys W^3 , that are suitably supported below the floor of the car-body, thence leads to and engages sheaves or pulleys W^4 and W^5 , suitably supported, respectively, below and above the turn-table, thence to and over pulleys R R on shaft Q, and thence to an idler and tightener W^6 , (see Fig. 5,) located in suitable proximity to pulleys R. The block W^7 , that carries idler and tightener W^6 , is adjustable endwise of ways or guides W^8 , arranged longitudinally of and rigid with beams or members d d of the A-shaped structure of the boom or crane and has attached a chain or cable X, that at its other end is secured to and is adapted to wind upon a drum or windlass X' , suitably supported at or near the lower end of said members d of the boom or crane, the slack of endless chain W being taken up by winding chain or cable X upon said drum or windlass. Drum or windlass X' , near one end, is provided with a ratchet-wheel X^2 , that is engaged by a pawl X^3 , operatively mounted upon a shaft X^4 , that is located in suitable proximity to the drum or windlass and supported from beams or members d d of the crane or boom, said pawl and ratchet-wheel being suitably arranged to lock the drum or windlass as against rotation in the direction to unwind the chain or cable on the drum or windlass, and to thereby lock the adjustable idler and tightener in the desired adjustment. The female members of the friction-clutches employed to establish operative connection between pulleys R R and the reversible shaft Q are preferably integral with each other, as shown, with the periphery of the one member flush with the periphery of the other member, and a brake-band Y is provided for simultaneously engaging and braking both of said clutch members, and said brake-band is operated by any approved mechanism, which it is not considered necessary to illustrate or describe.

I would call especial attention to the improved boom construction, that consists in the main of the combination, with the upwardly-converging beams or members d d' , of the two cross bars or beams d^2 d^2 , located such a distance below the apex of the boom or crane as to render the latter exceedingly stable, and arranged such a distance apart as to accommodate the elevation of the shovel proper or dipper to near the apex of the crane or boom. My said improved construction of boom embodies, therefore, great rigidity without interference with the hoisting of the dipper to near the upper extremity of the boom or crane.

What I claim is—

1. A steam shovel or excavator comprising an A-shaped boom or crane, shovel or dipper

arranged to dig or excavate toward the machine's body portion, means for hoisting and lowering the shovel proper or dipper, means for thrusting the same in and out, and the boom or crane comprising upwardly-converging beams or members and two cross bars or beams connecting said converging members with each other a suitable distance below the upper ends of said converging members and located such a distance apart as to accommodate the elevation of the shovel proper or dipper between them, substantially as set forth.

2. A steam shovel or excavator of the variety indicated, having an A-shaped boom or crane consisting of upwardly-converging pairs of beams or members d d and d' d' , with the members of each pair of said beams suitably tied together and braced apart, and two cross bars or beams d^2 d^2 located a suitable distance apart at opposite sides, respectively, of, and suitably secured to, the aforesaid pairs of converging members of the boom or crane, substantially as shown, for the purpose specified.

3. In a steam shovel or excavator, the combination of the body portion of the machine, turn-table carried by said body portion, boom or crane, shovel or dipper borne by the crane or boom and arranged to dig or excavate in the direction of the body portion, a chain or cable for hoisting and lowering the shovel or dipper, and an endless chain or cable operatively connected with the dipper or shovel for thrusting the latter in and out, mechanism for operating said last-mentioned cable independently of the hoisting chain or cable, substantially as set forth.

4. In a steam shovel or excavator, the combination of the body portion of the machine, shovel proper or dipper carrying boom or crane suitably connected with said body portion and consisting of an A-shaped structure, a reversible shaft supported from said structure, a pinion-bearing shaft borne by said structure, sprocket wheels and chains operatively connecting said shafts with each other, suitable means whereby the reversible shaft is capable of being rotated in opposite directions, the shovel or dipper arm being provided with a rack or racks engaging the pinion or pinions on the aforesaid pinion-bearing shaft, chain or cable for swinging the shovel proper or dipper in a vertical plane, and suitable means for actuating said chain or cable, substantially as set forth.

5. In a steam shovel or excavator, the combination of the body portion of the machine, shovel proper or dipper carrying boom or crane suitably connected with said body portion and consisting of an A-shaped structure composed of beams or timbers d d d' d' and d^2 d^2 suitably secured together and arranged substantially as indicated, a reversible shaft supported from beams or timbers d d and a pinion-bearing shaft supported from beams or members d' d' , sprocket wheels and chains operatively connecting said shafts with each

other, suitable means whereby the reversible shaft is capable of being rotated in opposite directions, the shovel or dipper arm being provided with a rack or racks engaging the pinion or pinions on the aforesaid pinion-bearing shaft, chain or cable for swinging the shovel proper or dipper in a vertical plane, and suitable means for actuating said chain or cable, substantially as set forth.

6. In a steam shovel or excavator, the combination of the body portion of the machine, turn-table B and bracket E arranged substantially as indicated, of the shovel proper or dipper and boom or crane that carries said dipper or shovel proper, said boom or crane consisting of an A-shaped structure composed of beams or timbers d' d' , d^2 d^2 , d^3 d^3 , suitably tied and connected together and arranged substantially as indicated, the boom or crane being rigid with the aforesaid turn-table and suitably connected with the aforesaid bracket, a pinion-bearing shaft K supported at or near the outer end of the crane or boom, a reversible shaft Q supported from and at or near the inner end of said crane or boom, sprocket-wheels and sprocket-chains operatively connecting said shafts with each other, suitable means whereby said reversible shaft is capable of being rotated in opposite directions, one or more racks on the shovel or dipper arm engaging the pinion or pinions on the aforesaid pinion-bearing shaft, and means for swinging the shovel proper or dipper in opposite directions, substantially as set forth.

7. In a steam shovel or excavator, the combination of the body portion of the machine, shovel proper or dipper, A-shaped boom or crane carrying the dipper or shovel proper and suitably supported from the body portion of the machine, a pinion-bearing shaft supported from and at or near the outer extremity of said crane or boom, one or more racks on the shovel or dipper arm meshing with the pinion or pinions upon said shaft, suitable means for rotating said shaft in opposite directions, a winding-drum N⁶ on the body portion of the machine, chain or cable N for swinging the shovel proper or dipper in a vertical plane, said chain or cable at one end being fastened to and at or near the apex of the A-shaped boom or crane, thence leading to and being operatively connected with the shovel proper or dipper, and thence leading to and engaging the aforesaid winding-drum, substantially as and for the purpose set forth.

8. In a steam shovel or excavator, the combination of a boom or crane, shovel proper or dipper, pinion-bearing shaft carried by the crane or boom, one or more racks on the shovel or dipper arm meshing with the pinion or pinions upon said shaft, chain or cable for swinging the bucket proper or dipper in a vertical plane, means for actuating said chain or cable, a reversible shaft borne by the crane or boom and operatively connected with the aforesaid pinion-bearing shaft, two pulleys loose upon the reversible shaft, a shaft W²

adapted to rotate continuously in one direction, a pulley W' operatively mounted upon said shaft, an idler supported in suitable proximity to the aforesaid loose pulleys and an endless chain engaging said loose pulleys, idler and pulley W' in such a manner as to rotate the aforesaid loose pulleys in opposite directions, respectively, and a clutch for each of said loose pulleys for establishing operative connection between said pulley and its supporting-shaft, substantially as and for the purpose set forth.

9. In a steam shovel or excavator, the combination of a boom or crane, shovel proper or dipper, pinion-bearing shaft carried by the crane or boom, one or more racks on the shovel or dipper arm meshing with the pinion or pinions upon said shaft, chain or cable for swinging the bucket proper or dipper in a vertical plane, means for actuating said chain or cable, a reversible shaft borne by the crane or boom and operatively connected with the aforesaid pinion-bearing shaft, two pulleys loose upon the reversible shaft, a shaft W² adapted to rotate continuously in one direction, and a pulley W' operatively mounted upon said shaft, an idler supported in suitable proximity to the aforesaid loose pulleys and an endless chain engaging said loose pulleys, idler and pulley W' in such a manner as to rotate the aforesaid loose pulleys in opposite directions, respectively, a friction-clutch for each of said pulleys, both clutches being located between the pulleys, the male member of each clutch being rigid or operatively connected with the respective pulley and the female members being rigid or operatively connected with the shaft, and a brake-band adapted to

brake the female members of both clutches, substantially as set forth.

10. In a steam shovel or excavator, the combination of a boom or crane, shovel proper or dipper, pinion-bearing shaft carried by the crane or boom, one or more racks on the shovel or dipper arm meshing with the pinion or pinions upon said shaft, chain or cable for swinging the bucket proper or dipper in a vertical plane, means for actuating said chain or cable, a reversible shaft borne by the crane or boom and operatively connected with the aforesaid pinion-bearing shaft, two pocket-pulleys loose upon the reversible shaft, a shaft W² adapted to rotate continuously in one direction, and a pulley W' operatively mounted upon said shaft, an idler supported in suitable proximity to the aforesaid loose pulleys and an endless chain engaging said loose pulleys, idler and pulley W' in such a manner as to rotate the aforesaid loose pulleys in opposite directions, respectively, and a clutch for each of said loose pulleys for establishing operative connection between said pulley and its supporting-shaft, drum or windless, X', a chain or cable, X, connecting the block that carries the aforesaid idler with said drum or windlass, and suitable means for locking said drum or windlass as against rotation in the direction to unwind the chain or cable wound thereon, substantially as set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 16th day of December, 1893.

GEORGE W. KING.

Witnesses:

JOHN F. MCNEAL,
ALFRED F. MCNEAL.