(No Model.) 4 Sheets—Sheet 1.

G. W. KING.

TRAVELING CRANE.

No. 528,781. Patented Nov. 6, 1894.

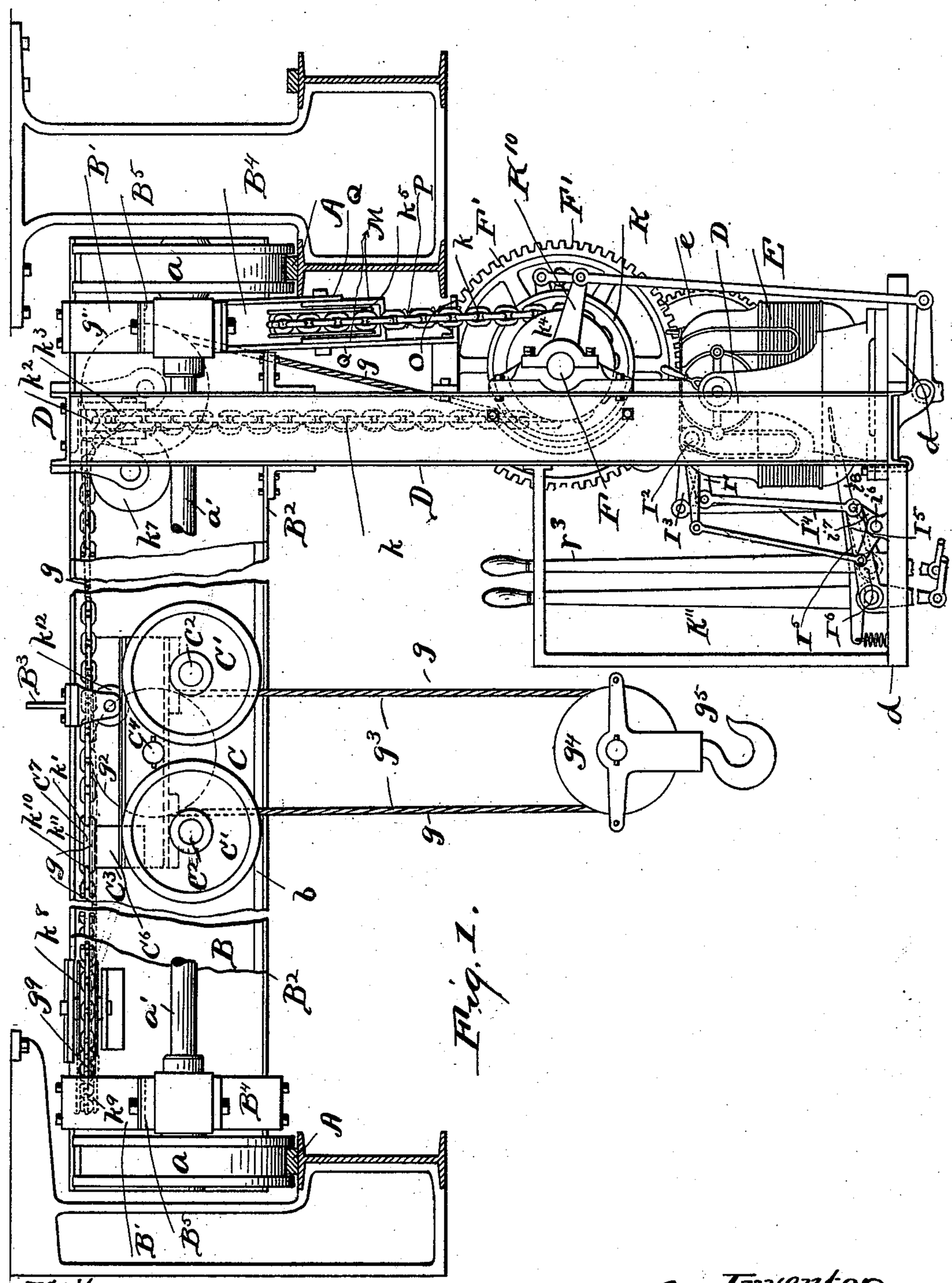

Fig. 1.

Witnesses.
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(No Model.) 4 Sheets—Sheet 2.

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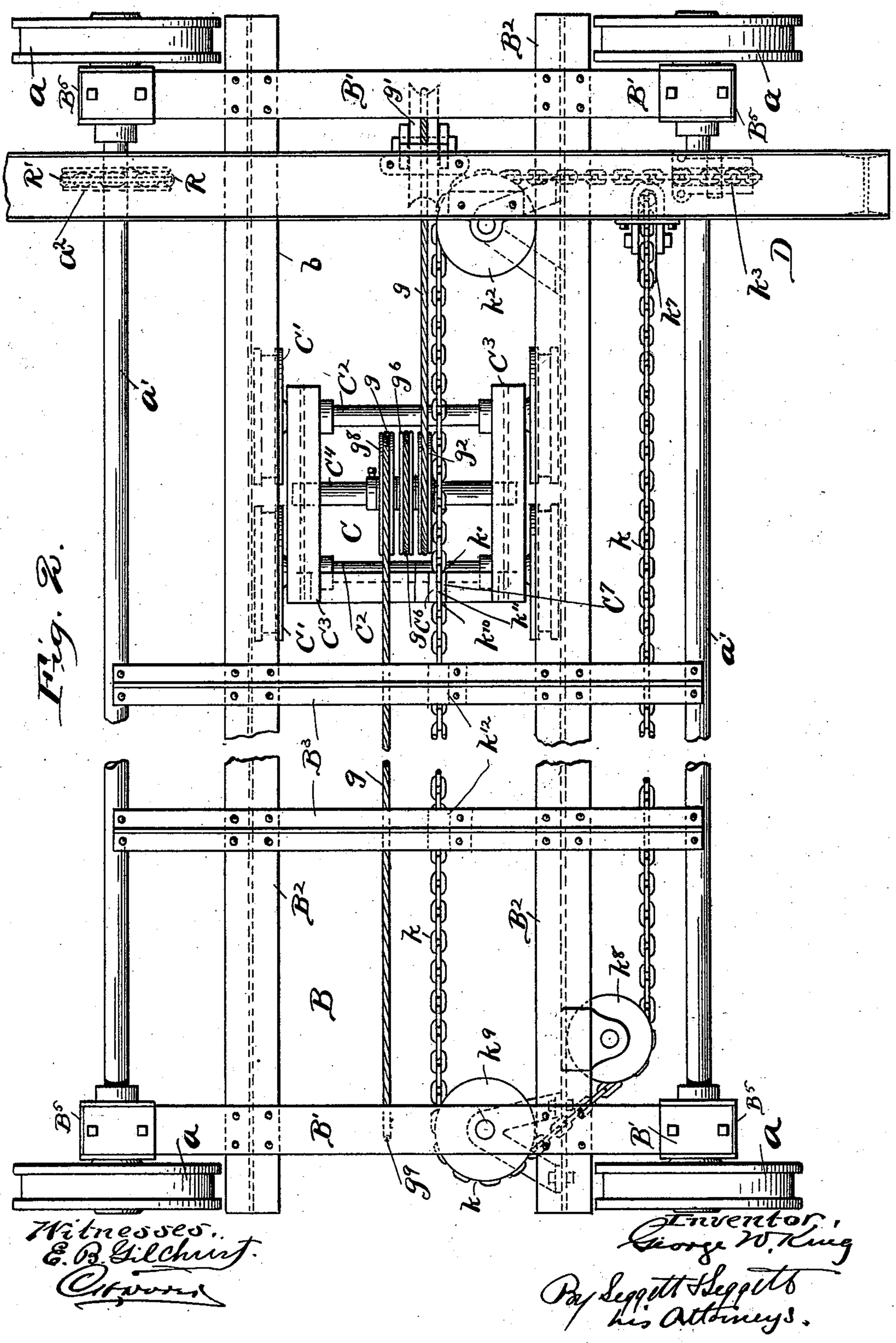

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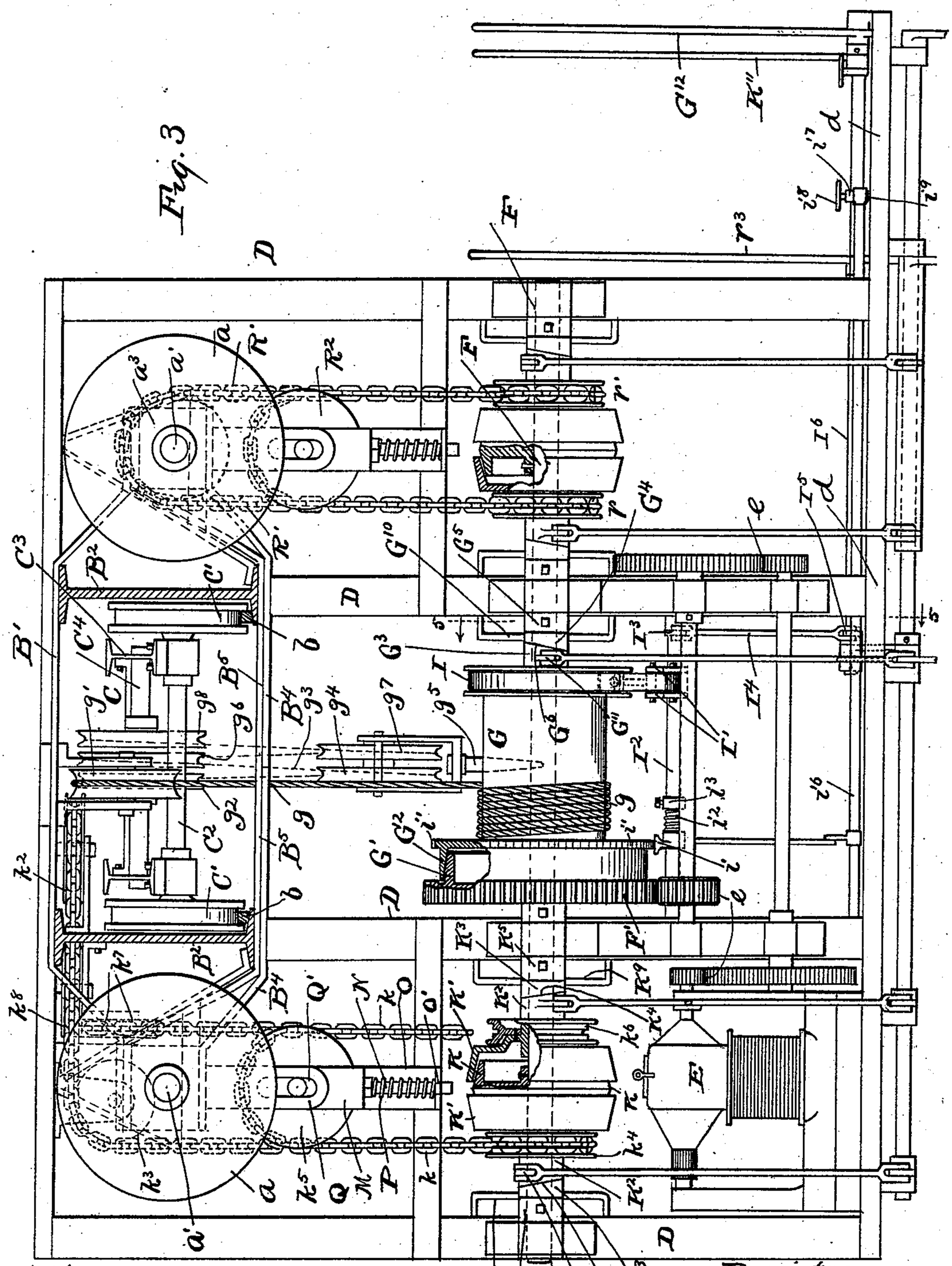
G. W. KING.

TRAVELING CRANE.

No. 528,781. Patented Nov. 6, 1894.

Fig. 3.



Witnesses.
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(No Model.) 4 Sheets—Sheet 4.

G. W. KING.

TRAVELING CRANE.

No. 528,781. Patented Nov. 6, 1894.

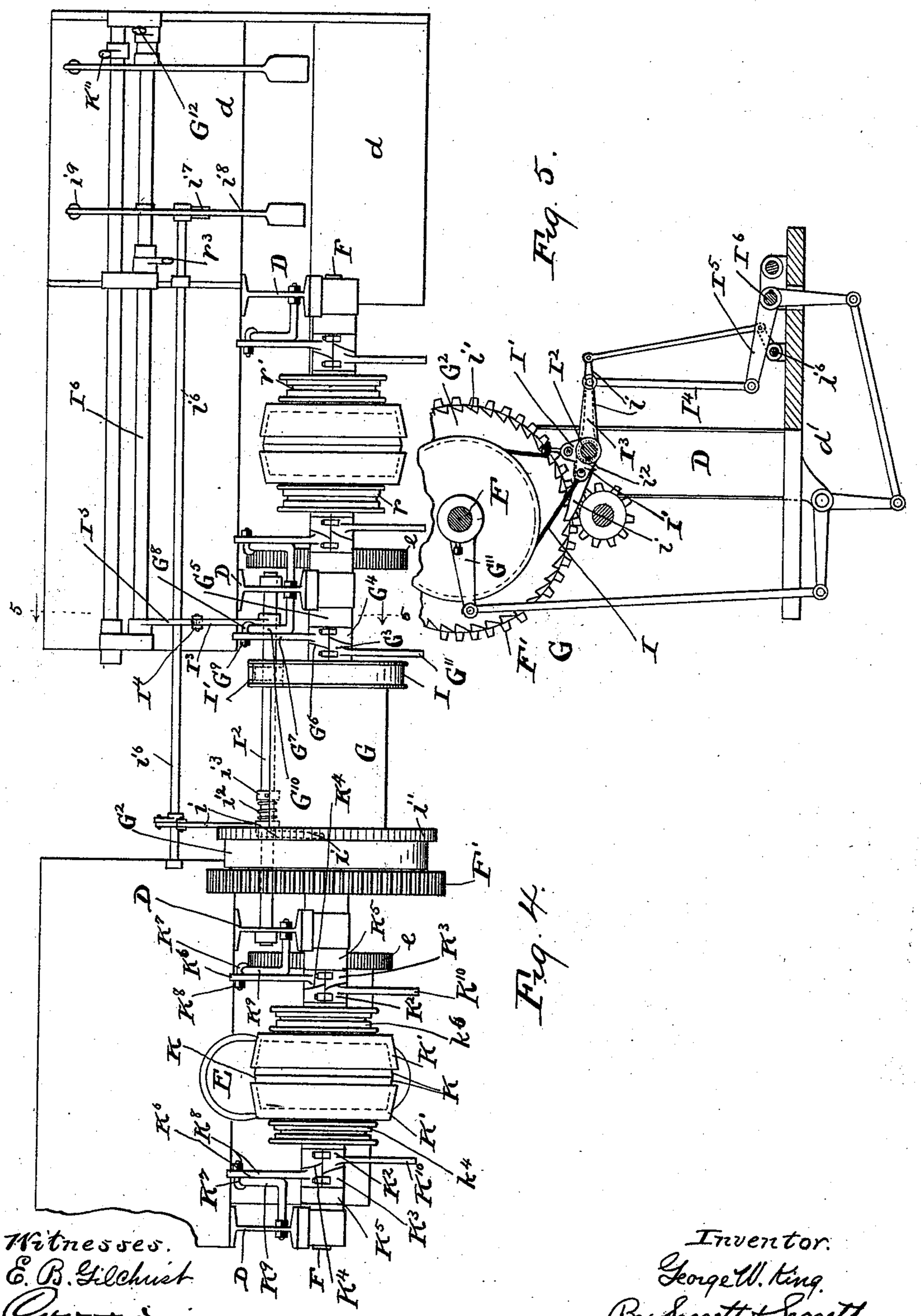

Fig. 4.

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UNITED STATES PATENT OFFICE.

GEORGE W. KING, OF MARION, OHIO.

TRAVELING CRANE.

SPECIFICATION forming part of Letters Patent No. 528,781, dated November 6, 1894.

Application filed March 29, 1894. Serial No. 505,570. (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 Improvements in Traveling Cranes; 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 the same.

My invention relates to improvements in traveling-cranes, the object being to operate the entire machine by one electric motor located on the crane and running continuously in one direction while the crane-proper can be made to travel in either direction on its track and the trolley can be made to travel in either direction across the crane and the load can be hoisted or lowered, and to have all of these motions independent of each other so that the operator is enabled to raise the load and make it travel in any desired direction at the same time.

By my invention the actual weight of the machine is greatly reduced, and, besides, the operating machinery is carried at or near one end of the crane, thus relieving the bridge. Briefly stated, the working parts of my improved machine are designed and arranged to possess a maximum of efficiency with a minimum of weight.

My invention also consists in certain novel features of construction and combinations of parts hereinafter described and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of my improved crane, the track upon which the crane-proper is mounted being shown in section, and portions being broken away to more clearly show the construction and reduce the size of the figure. Fig. 2 is a top plan of a portion of the machine. Fig. 3 is an elevation, partly in section, of the end of the crane at which the driving-machinery is located. Fig. 4 is a top plan, of a portion of the driving-machinery of the crane. Fig. 5 is an elevation in detail, partly in section on line 5—5, Fig. 4, showing the lever-mechanism that operatively connects brake-band I with shaft I^6 and showing also the operative connection between pawl *i* and shaft i^6.

I might remark that in all of the figures just referred to, portions are broken away and in section to more clearly show the construction and to reduce the size of the figure.

Referring to the drawings, A A (see Fig. 1) represent the track upon which the crane-proper is mounted, said track being suitably supported from above, and the rails of the track being located at or near opposite ends of the crane, respectively. The crane is shown provided with two pairs of wheels *a* engaging said track, and the wheels of each pair of wheels are connected by an axle *a'*. Axles *a'* are supported in any suitable manner from the trolley-carrying bridge B, for instance, as shown in Fig. 2, by transversely-arranged bars or members B' secured to the longitudinal girders or beams B^2 of the bridge.

C designates the trolley that is shown provided with two pairs of wheels C' engaging rails *b* rigid and arranged parallel with longitudinal girders B^2 of the bridge, the wheels of each pair of trolley-wheels C' being connected by an axle C^2, and axles C^2 support the trolley-frame C^3.

The driving-machinery is carried by frame-work D depending and suitably supported from one end of bridge B. (See Figs. 1 and 3.) From the lower portion and at one end of frame-work D is supported an electric motor, E, (see Fig. 3) from which motion, by means of suitable gearing and shafting, as at *e*, is communicated to a gear F' operatively mounted on shaft F arranged lengthwise of frame-work D, (that is, transversely of the crane) and suitably supported by said frame-work.

Motion for moving the crane-proper along the track upon which it is mounted, for moving the trolley along its track and for hoisting and lowering the load carried by the trolley, is communicated from shaft F.

Referring, first, to the apparatus employed for hoisting and lowering the load carried by the trolley, *g* (see Figs. 1, 2 and 3) represents the hoisting-rope or cable that, at one end, is secured to hoisting-drum G loosely mounted on shaft F preferably upon the central portion of the shaft as shown. From said drum, rope or cable *g* leads upwardly to and over a sheave *g'* suitably supported at the upper end of frame-work D and at one end of bridge B. Thence rope or cable *g* leads to and over a

sheave g^2 mounted upon a shaft C^4 carried by trolley-frame C^3 and is provided with a double fall g^3 at the trolley, the rope or cable, from sheave g^2, leading downwardly to and over a sheave, g^4, of the hoisting tackle g^5 carried by the rope or cable at the lower end of the fall, thence leading upwardly to and over another sheave g^6 mounted on shaft C^4 of the trolley; thence leading downwardly again to and over another sheave g^7 of the hoisting-tackle; thence upwardly again to and over another sheave g^8 mounted on shaft C^4 of the trolley, whence the cable or rope leads to the other end of the bridge of the crane (end opposite to the location of driving machinery) where it is secured at g^9. By the construction just described, it will be observed that the hoisting-tackle and load (not shown) carried thereby, are elevated or lowered according as the hoisting rope or cable is wound upon or paid out by drum G, the drum being adapted to be actuated to pay out rope or cable to lower the load by the gravity of the hoisting-tackle and load, the drum in paying out rope or cable, rotating in a direction opposite to the direction of rotation of the drum-supporting-shaft. To wind the rope or cable upon the drum and as required to effect the hoisting of the load, the drum is operatively connected with shaft F, which operative connection is effected by suitable clutch-mechanism, preferably a friction-clutch. A friction clutch is employed in the case illustrated. The male member G′ of the clutch is shown integral with gear F′ that is rigid upon the shaft and the female member G^2 of the clutch is shown rigid with the hoisting-drum. It will, therefore, be observed that, by actuating the drum endwise to bring the female member of the clutch into operative connection with the male member of the clutch, operative connection is established between the drum and shaft F, resulting in the rotation of the drum to hoist the load.

Any suitable lever-mechanism is employed for actuating drum G to establish operative connection between the members of the clutch employed for operatively connecting the drum with shaft F. A preferable construction of mechanism is illustrated and comprises (see Figs. 3 and 4) a pair of collars G^3 G^4 loosely mounted, side by side, upon shaft F at one end of the drum, G^3 designating the collar next adjacent to the drum and collar G^4 being held in engagement with collar G^3 by means of a collar G^5 rigid on shaft F. The engaging ends of collars G^3 G^4 are provided, respectively, with one or more inclines, G^6, the arrangement and trend whereof are such that collar G^3 upon being turned in the one direction, shall be actuated inwardly and thereby effect frictional engagement between the clutch-members and thereby cause the drum to be operatively connected with shaft F, and by turning said collar in the opposite direction the clutch-members shall be released relative to each other to permit the drum to be arrested or reversed.

Collar G^4 is held stationary, the same having preferably a laterally-extending arm G^7 that, by means of a bolt and nut, G^8 and G^9, respectively, (see Fig. 4) is secured to a segment G^{10} rigid with frame-work D, the head of the bolt being hook-shaped and adapted to tightly engage the segment by tightening nut G^9 on the bolt and thereby secure collar G^4 in the desired adjustment. By loosening the nut and consequently the grip of the bolt on the segment the collar is rendered free for circumferential adjustment as required from time to time as the parts become worn. Collar G^3 has a laterally-extending arm G^{11} that is operatively connected, by suitable lever-mechanism, with a hand-lever G^{12} on the operator's platform or stand *d*, that is borne by frame D. Said lever G^{12}, in the present instance, is operatively mounted upon shaft I^6 hereinafter referred to. The arrangement of parts is such that the hoisting-drum is operatively connected with shaft F or released according as lever G^{12} is actuated in the one direction or the other.

Suitable brake-mechanism is also provided for holding the load when elevated and propelled and to govern the descent of the load. The brake comprises preferably a brake-band I passed around and adapted to frictionally engage an annular rim on the one end of the hoisting-drum. The brake-band is applied in the usual manner of brake-bands, and is operatively connected with a bell-crank-arm or lever I′ of shaft I^2 that is suitably supported from frame-work D and arranged parallel with and a suitable distance below and at one side of the hoisting-drum. (See Figs. 1, 3 and 4.) Shaft I has another arm or lever I^3 that is operatively connected, by means of a link I^4, with an arm or lever I^5, operatively mounted on shaft I^6 that is operated by means of hand-lever G^{12}. The arrangement of parts is such that the brake-band is applied by actuating lever G^{12} in the direction to interrupt operative connection between the hoisting-drum and the drum-supporting-shaft, and is released upon actuating said lever in the direction to establish operative connection between said drum and supporting-shaft.

Shaft I^2, for the purpose of positively holding the load in all cases, is also provided with a pawl or ratchet *i* that is adapted to engage the teeth of a ratchet-wheel, *i*′, operatively connected with the hoisting-drum, the ratchet-wheel being preferably integral with the female member of the clutch employed to establish operative connection between the drum and shaft F, and the pawl or ratchet is held to its engagement with the ratchet-wheel by means of a coil-spring, i^2, operatively connected with the pawl or ratchet and confined upon shaft I^2 between said ratchet or pawl and a collar i^3 rigid on the shaft. Pawl or ratchet *i* is operatively connected with a shaft i^6 and the latter is provided with an arm or lever i^7 that is adapted to be depressed by a foot-lever i^8 within convenient reach of the op-

erator and preferably loosely fulcrumed upon shaft I^6. (See Fig. 4.) Said pawl or ratchet, in the case illustrated, is supposed to be loosely mounted upon shaft I^2 and is operatively connected by any suitable lever-mechanism, such, for instance, as shown in Fig. 5, with shaft I^6. The arrangement of parts is such that upon depressing the foot-lever the mechanism connecting said lever with pawl or ratchet *i* is actuated to disengage the latter from the ratchet-wheel as required when it is desired to lower the hoisting-tackle or load carried by the trolley. As soon as the operator's foot is removed from lever i^8 the latter is automatically returned to its normal position by a spring i^9, attached at opposite ends to said lever i^8 and platform *d*, respectively. Pawl i^7 is, of course, left in position engaging the ratchet-wheel during the hoisting and propulsion of the load, said ratchet-wheel and pawl positively locking the drum as against being turned in the direction for lowering the load.

Having thus described the apparatus involved in the hoisting and lowering of the hoisting-tackle or load carried by the trolley, I will next refer to the apparatus employed for propelling the trolley in either direction.

A continuous chain *k* is operatively connected with the trolley at both ends, as at *k'* k^{10}, from which points the chain leads in opposite directions, the chain leading from point *k'* to and over a horizontal sheave k^2 provided at the end of bridge B above the driving-machinery; thence leads to and over a vertical sheave k^3 supported at the top of frame-work D approximately directly above the driving-motor; thence leads downwardly to and over a pocket or chain-pulley k^4 loosely mounted on shaft F; thence upwardly to and over an idler and tightener k^5; thence downwardly to and over another pocket or chain-pulley k^6 loosely mounted on shaft F; thence upwardly to and over a sheave k^7 suitably supported at the top of frame-work D; thence to and over sheaves k^8 k^9 (see Fig. 2) suitably supported from bridge B, at the opposite end of the route (that is at the end opposite to the location of the driving-machinery); and thence returns to the trolley where it is secured at k^{10}. By the construction just described, it will be observed that the trolley will be propelled in the one direction or the other according as the propelling-chain is actuated in the one or the other direction. Both ends of the propelling chain are preferably secured to the trolley by a single link k^{11} that embraces a laterally-projecting flange C^7 at the upper end of an upright arm C^6 of the frame of trolley or carriage C. Chain *k* is preferably supported between the ends of the bridge B by one or more pulleys k^{12} suitably supported from said bridge. It will also be observed that the propelling chain is propelled in the one direction or the other according as the pulley k^4 or pulley k^6 is operatively connected with shaft F that, as alreadyindicated is always rotating in one and the same direction. Suitable clutch-mechanism is provided for establishing operative connection between either of said pulleys and shaft F. Friction-clutches are preferably employed for the purpose. Pulleys k^4 k^6 (see Figs. 3 and 4) are located at suitable intervals apart and the male member K of the clutch for each pulley is rigidly mounted on shaft F, the male members of the two clutches being preferably integral as shown and located between the female members K' of the clutches, the female-members being operatively connected with the pulleys in any suitable manner so that as the members of either clutch are thrown into frictional engagement with each other, the pulley carrying the one member of said clutch is operatively connected with shaft F. A pair of collars K^2 K^3 are loosely mounted, side by side, at the outer end of each pulley, the outer collar K^3, in each case being held stationary and the inner collar being capable of turning, both collars, upon their opposing faces having one or more inclines, K^4, the arrangement and trend whereof are such that the inner collar upon being turned in the required direction, shall actuate the adjacent pulley to bring the clutch-member carried thereby into operative connection with the companion-clutch-member and thereby establish operative connection between said pulley and shaft F, and when said pulley-actuating collar is turned in the opposite direction the clutch-members shall be freed relative to each other. Stationary collars K^3 are held from being pushed outwardly, respectively, away from the adjacent collar K^4, by means of a collar K^5 rigid on shaft F. Collars K^3 have each a laterally-extending arm, K^6, that is adjustably secured by means of a bolt and nut, K^7 K^8, respectively, to a segment K^9 rigid with frame-work D. By loosening the securing nuts on bolts, collars K^3 may be adjusted circumferentially from time to time to take up the wear had on the opposing faces of the contiguous collars K^3 K^4, collars K^3 being secured in the desired adjustment by means of the aforesaid nuts and bolts.

The mechanism employed for actuating collars K^2 is preferably as follows: Each collar K^2 has a laterally-extending arm K^{10} that is operatively connected, by suitable lever-mechanism, with a hand-lever K^{11} located within convenient reach of the operator. Both clutches it will be observed are operatively connected with the same hand-lever, and the arrangement of parts is such that one of pulleys k^4 k^6 only can be operatively connected with the shaft at one time; that pulley k^4 or pulley k^6 is thrown into operative connection with shaft F according as the operating hand-lever is actuated into one or the other of its extreme positions, and that both pulleys are released when the hand-lever is caused to occupy an intermediate position.

The strap or block M of idler or tightener k^5 is preferably supported by a vertical rod, N, that is connected with the sheave-block or

strap and extends through a hole O′ in a bracket O rigid with frame-work D. (See Fig. 3.) Upon member N is confined a coil-spring P′ that acts in the direction to cause the idler and tightener to take up any slack in the propelling chain, the axial pin of the tightener extending into vertically-elongated holes, Q′, in a pair of guides, Q, upwardly between which the sheave-strap or block is adapted to slide in tightening the propelling chain, and spring P also acts to cushion the idler and tightener.

The apparatus employed for moving the crane-proper laterally consists preferably of an endless chain engaging a pocket or chain-pulley a^2 operatively mounted on one of the axles of the carrying-wheels of the crane, the sections R R′ of the chain leading from opposite sides of said pulley, respectively, (see Fig. 3) passing downwardly to and over pocket-pulleys r r' respectively, and thence leading upwardly to and over an idler and tightener R^2 where they meet. Pulleys r r' are loosely mounted on shaft F and it will, therefore, be observed that the crane-proper is actuated in the one direction or the other according as pulley r or pulley r' is operatively connected with shaft F. Suitable clutches are employed for establishing operative connection between pulleys r r', and the clutches preferably employed are substantially the same as those already described in connection with the trolley-propelling apparatus, and it is, therefore, not considered necessary to describe them in detail. Also the mechanism for establishing operative connection between the companion members of the clutches employed in connection with pulleys r and r' is substantially the same as that described in connection with pulleys k^4 k^6 and is operatively connected in any approved manner with hand-lever r^3 on the operator's stand.

Longitudinal beams or girders B^2 B^2 of the trolley-supporting-bridge, at suitable intervals between transverse bars or members B′, are connected with transverse girders or cross-ties, B^3, as shown in Fig. 2. Boxes a^3 in which axles a' are journaled, are supported between the ends of bars B′ on top, and similar bars B^4 at the bottom, bars or members B^4 being also preferably secured in any suitable manner to the bottom of beams or girders B^2. (See Fig. 3.) Transverse bars or members B′ are shown arched over the top of beams or girders B^2 and bars or members B^4 are arched over the bottom of said girders or beams. (See Fig. 3.) Bars B^5 shown interposed between the bottom of beams or girders B^2 and bars or members B^4, are suitably secured to the top of boxes a^3 and are arched under the bottom of beams or girders B^2, as shown in said figure. By the construction just described, an exceedingly strong and durable bridge is formed. The trolley-supporting-track b b is rigid with inwardly-projecting flanges at the bottom of beams or girders B^2, as shown very clearly in Fig. 3. Hence, it will be observed that the trolley runs between beams B^2 of the bridge. By thus running the trolley between the beams instead of on top, the tying together of said beams at the top, as hereinbefore described, is accommodated, and the space occupied by the crane is also materially reduced.

I would here remark that the reversing-gear disclosed in this application has been made the subject of an application for patent filed by me in the United States Patent Office on the 26th day of December, 1893, and which application bears Serial No. 494,712.

What I claim is—

1. In a traveling-crane, the combination with the track along which the crane-proper travels and a shaft F adapted to rotate continuously in one direction, of two pulleys mounted loose upon said shaft, suitable means for each pulley for establishing operative connection between the pulley and the shaft, and a chain or cable operatively connecting the crane-proper with each of said pulleys and adapted to actuate the crane-proper in the one direction or the other according as the one or the other of the aforesaid pulleys is operatively connected with the supporting-shaft, substantially as set forth.

2. In a traveling-crane, the combination with the track along which the crane-proper travels, and a shaft F adapted to rotate continuously in one direction, of two pulleys mounted loosely upon said shaft, a clutch for each pulley for establishing operative connection between the pulley and the shaft, an idler in suitable proximity to said pulleys, and an endless-chain or cable operatively connected with one of the axles of the crane-proper and engaging said pulleys and idler, the chain or cable passing from over the one pulley to and over the idler, and thence to and over the other pulley, substantially as set forth.

3. In a traveling-crane, the combination with the crane-proper, track along which the crane-proper travels, trolley and track for the trolley, an endless-chain operatively connected with one of the axles of the crane-proper for propelling the latter in opposite directions, a continuous chain or cable engaging and adapted to propel the trolley in opposite directions, and a rope or cable provided with fall and hoisting-tackle at the load-carriage for hoisting and lowering the load, of a shaft arranged transversely of and at or near one end of the crane, a motor operatively connected with the shaft, and devices carried by the shaft for actuating the aforesaid chains, ropes or cables, substantially as set forth.

4. In a traveling-crane, in combination, a trolley or load-carriage, operating-shaft, hoisting-drum loose on said shaft, hoisting-rope or cable provided with fall and hoisting-tackle at the trolley or carriage and operatively connected with the hoisting-drum, means for establishing operative connection between the drum and operating-shaft, a brake for said drum, and suitable means for positively lock-

ing the drum as against rotation in the direction to lower the load, substantially as set forth.

5. In a traveling-crane, in combination, a trolley or load-carriage, operating-shaft, hoisting-drum loose on said shaft, hoisting-rope or cable provided with fall and hoisting-tackle at the trolley or carriage and operatively connected with the hoisting-drum, means for establishing operative connection between the drum and operating-shaft, a brake for said drum, a pawl or ratchet and ratchet-wheel for positively locking the drum as against rotation in the direction to lower the load, and suitable means acting to retain said pawl or ratchet in its engagement with the ratchet-wheel, substantially as set forth.

6. In a traveling-crane, the combination of the crane-proper, track for the crane-proper, a shaft on the crane-proper adapted to rotate continuously in one direction, apparatus for hoisting and lowering the load, said apparatus comprising a drum loose on the aforesaid shaft, suitable means for establishing and interrupting operative connection between said drum and shaft, suitable apparatus for actuating the crane-proper in opposite directions, and means for establishing and interrupting operative connection between said apparatus and the aforesaid shaft, substantially as set forth.

7. In a traveling-crane, the combination with the crane-proper, track for the crane-proper, a shaft carried by the crane-proper and adapted to rotate continuously in one direction, a trolley or load-carriage and track for said carriage, apparatus for propelling the crane-proper in opposite directions and means for establishing and interrupting operative connection between said apparatus and the aforesaid shaft, apparatus for propelling the trolley in opposite directions and means for establishing and interrupting operative connection between said trolley-propelling apparatus and the load-carriage or trolley, suitable apparatus for hoisting and lowering the load and comprising a drum loosely mounted on the shaft and means for establishing and interrupting operative connection between said drum and shaft, substantially as set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 1st day of November, 1893.

GEORGE W. KING.

Witnesses:
C. H. DORER,
ROLLA C. PERRY.