(No Model.)

4 Sheets—Sheet 1.

M. C. BULLOCK.

HOISTING MACHINE.

No. 462,299. Patented Nov. 3, 1891.

Fig 1.

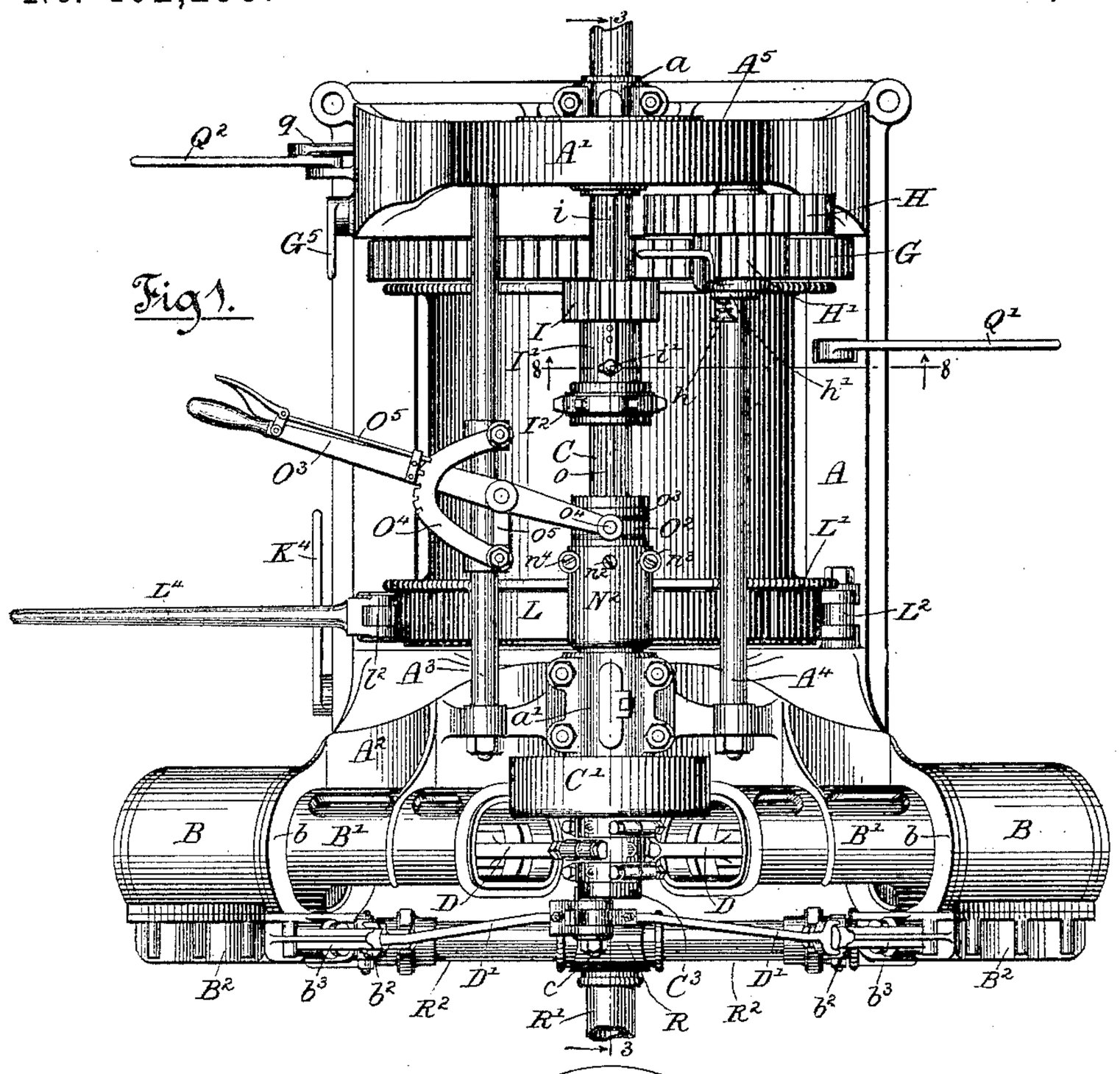
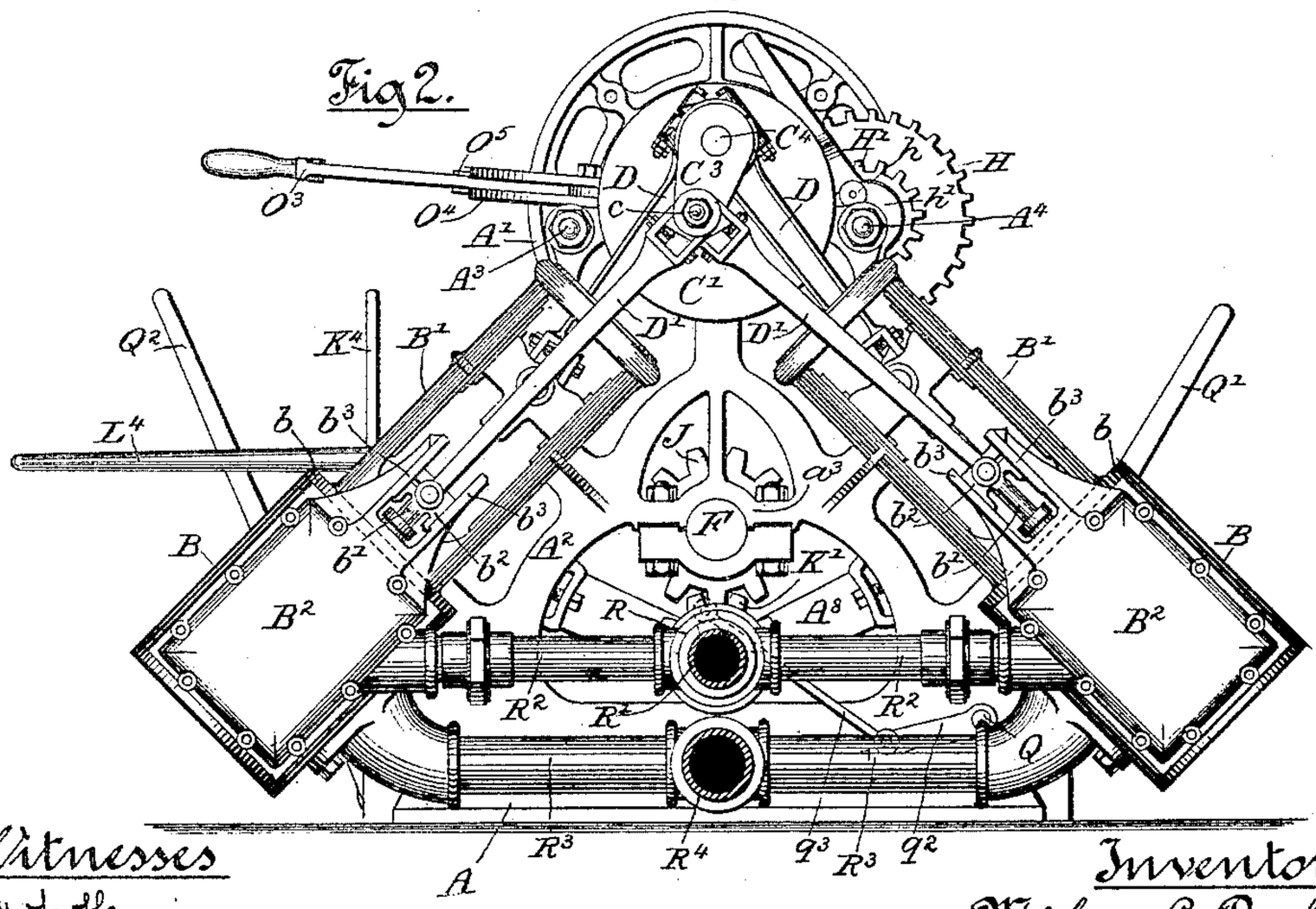


Fig 2.



Witnesses

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No Model.)

4 Sheets—Sheet 2.

M. C. BULLOCK.

HOISTING MACHINE.

No. 462,299. Patented Nov. 3, 1891.

Fig 3.

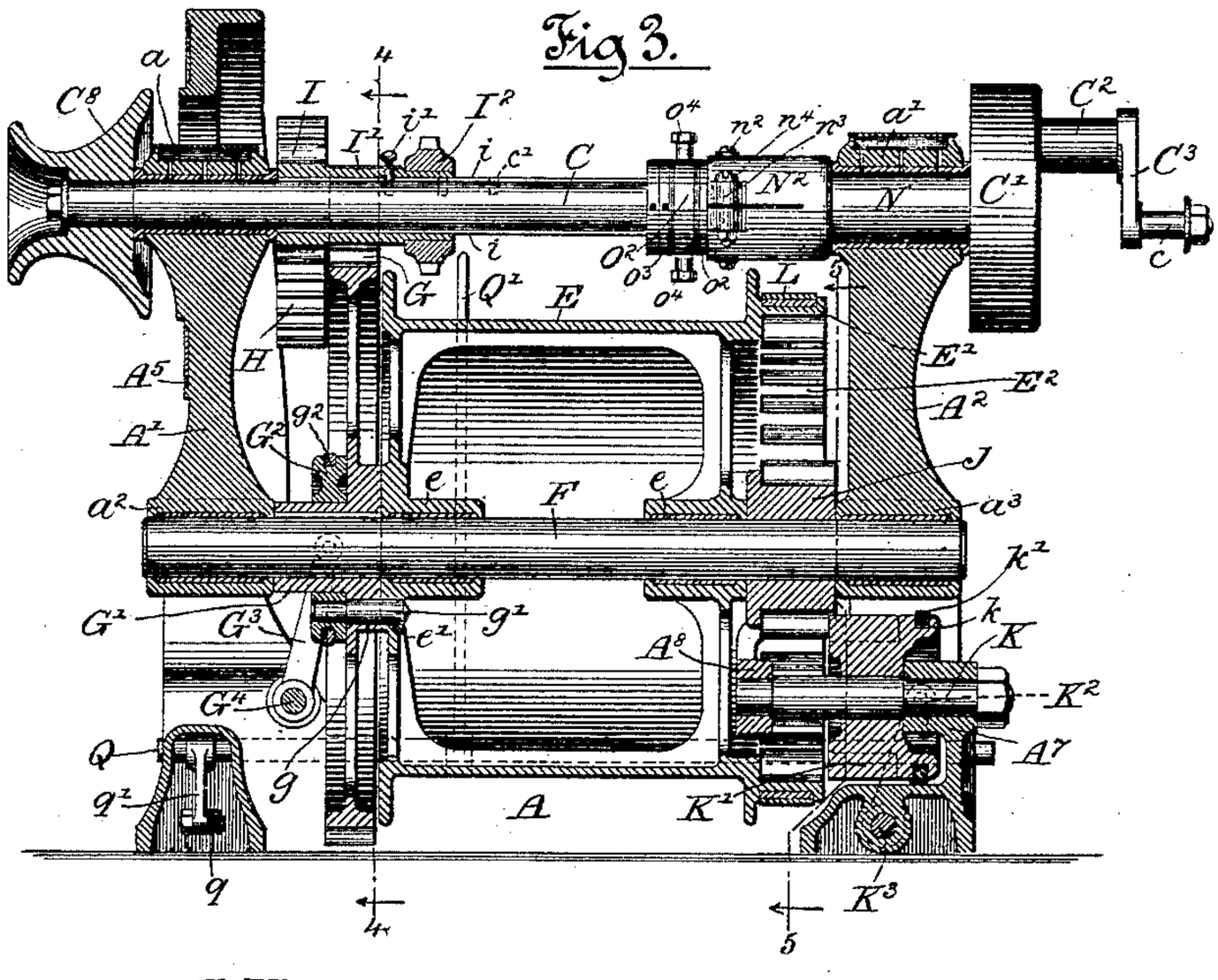


Fig 4.

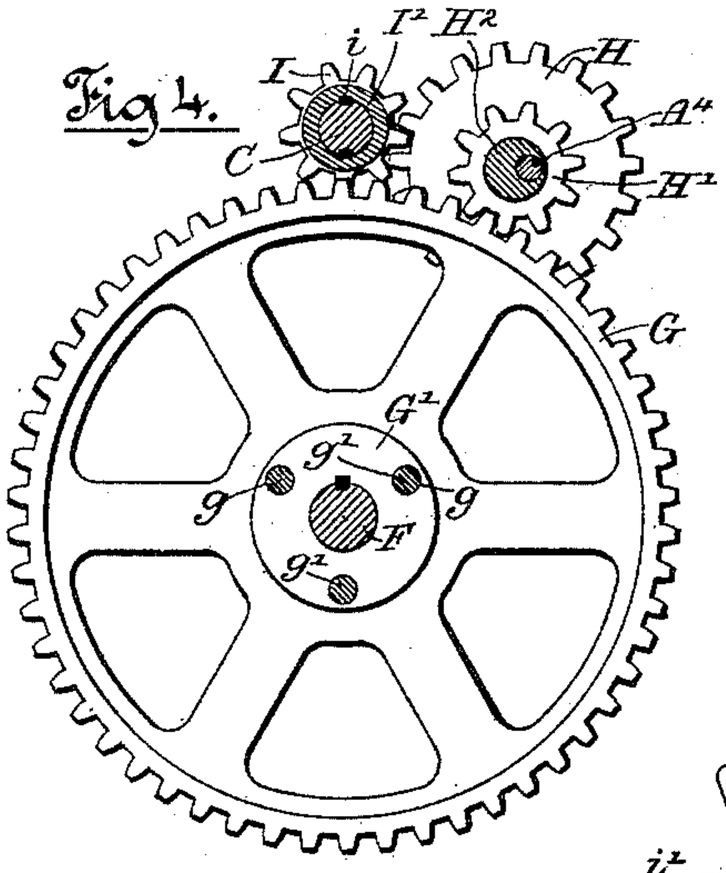


Fig 5.

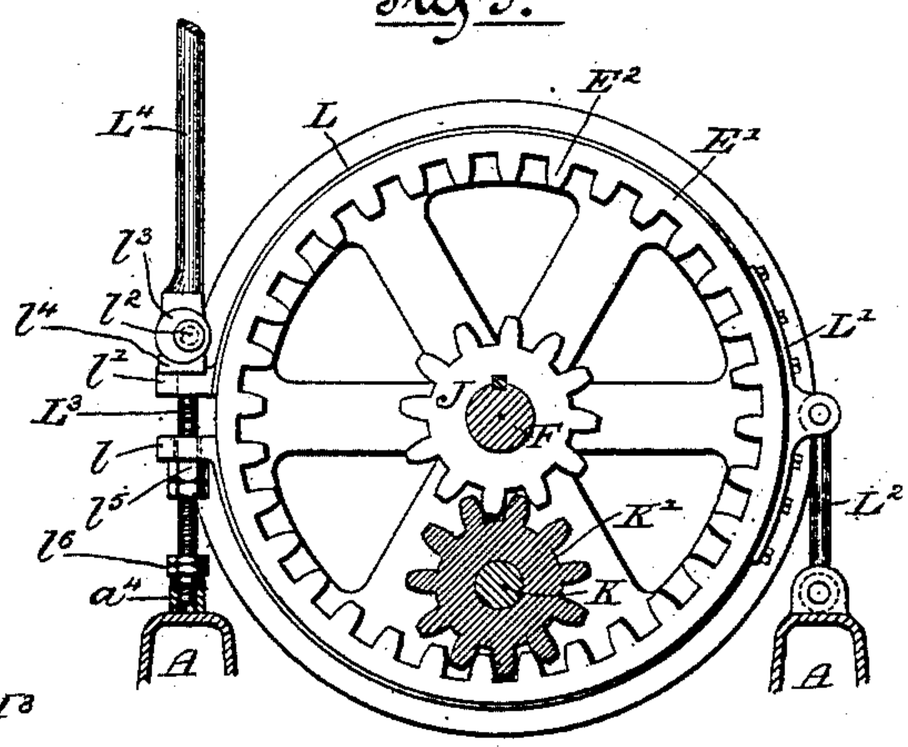
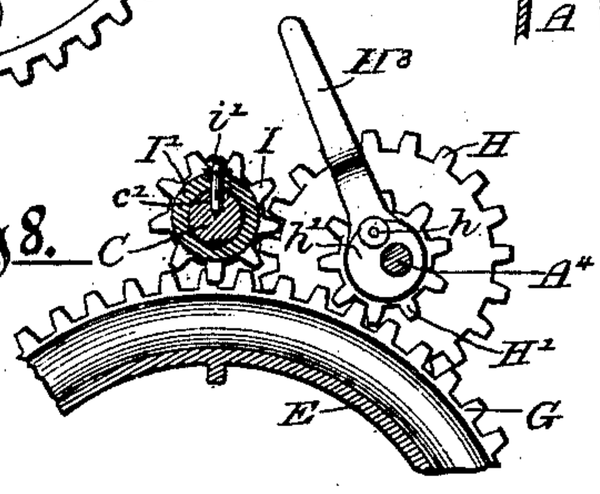


Fig 8.



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4 Sheets—Sheet 3.

M. C. BULLOCK.

HOISTING MACHINE.

No. 462,299. Patented Nov. 3, 1891.

Fig 6.

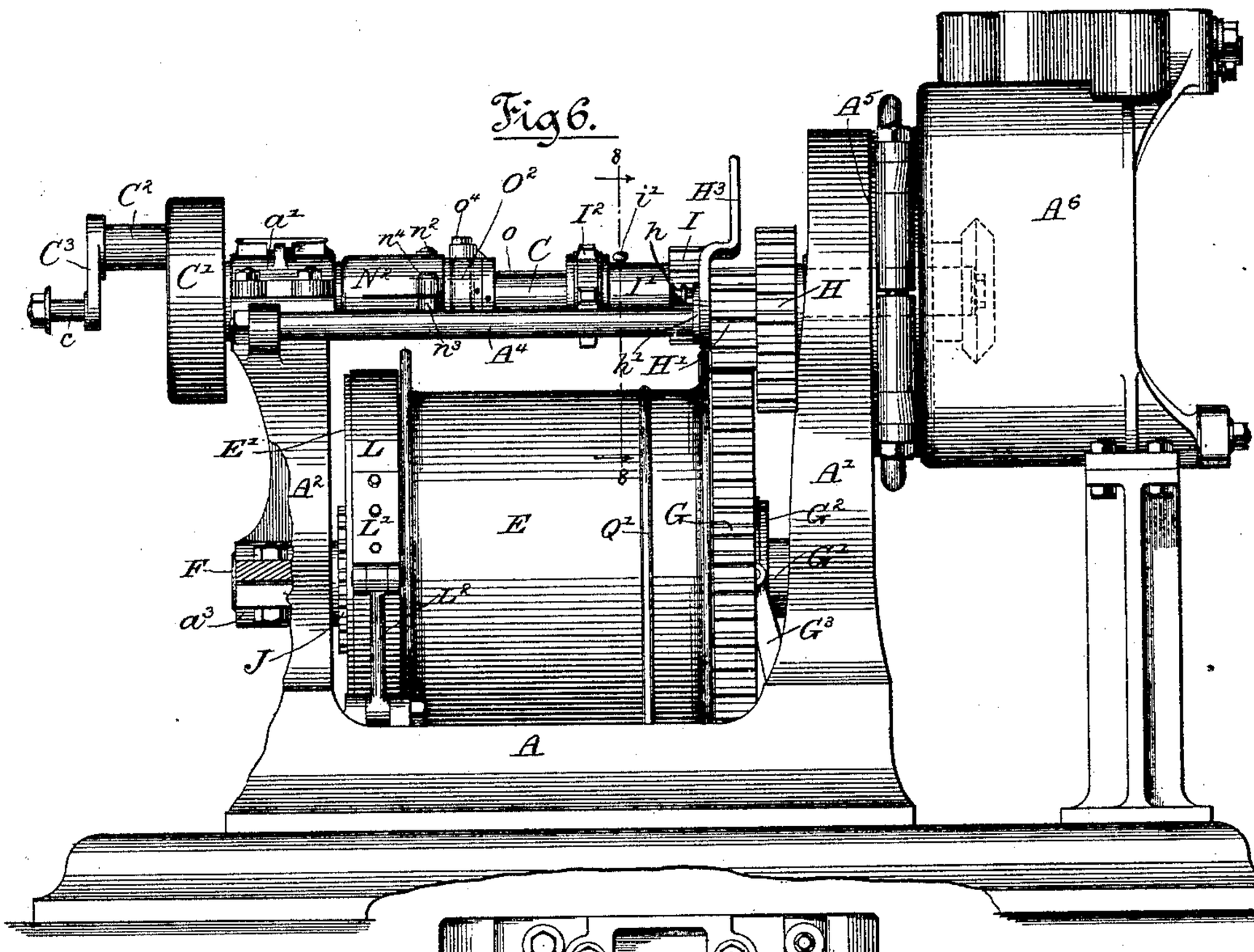
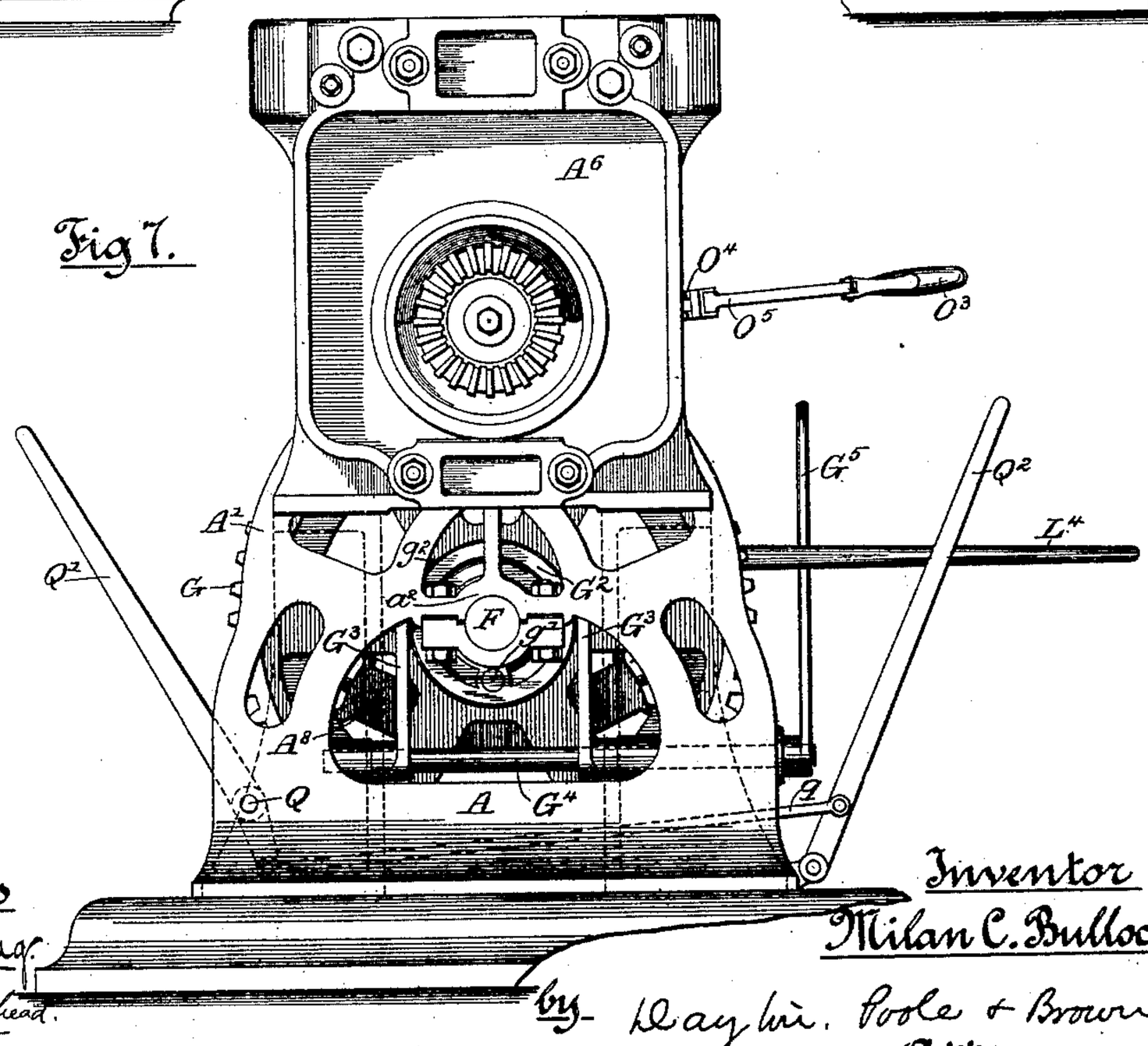


Fig 7.



(No Model.)

4 Sheets—Sheet 4.

M. C. BULLOCK.

HOISTING MACHINE.

No. 462,299. Patented Nov. 3, 1891.

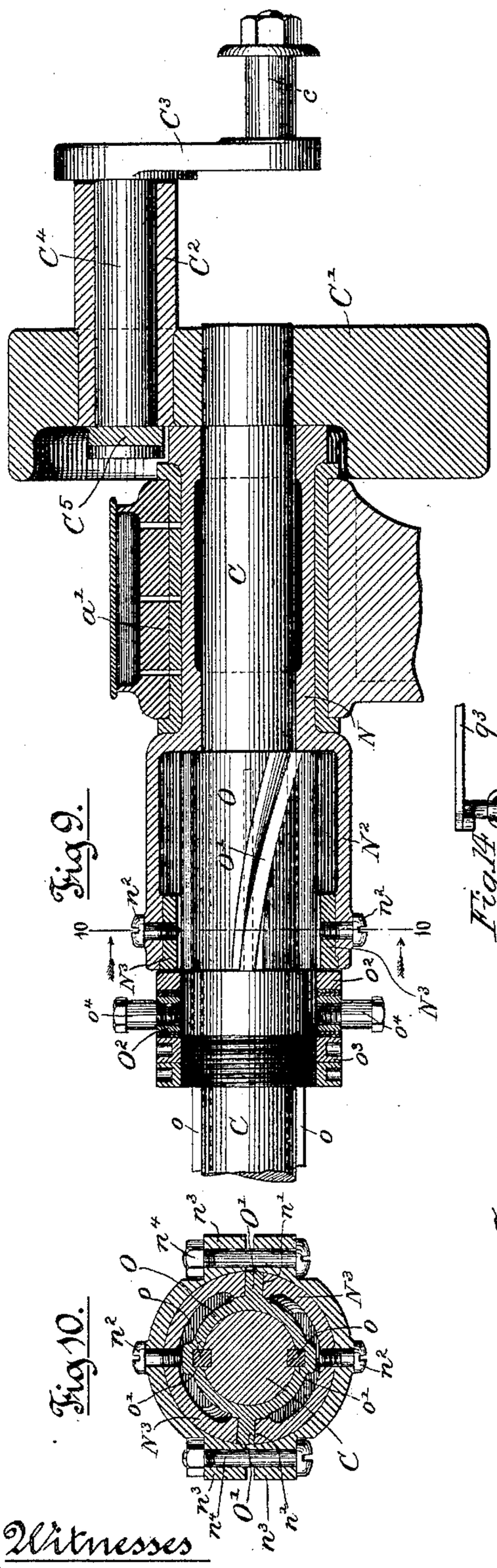


Fig. 9.

Fig. 10.

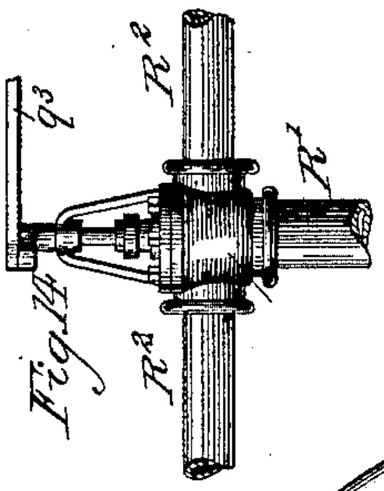


Fig. 14.

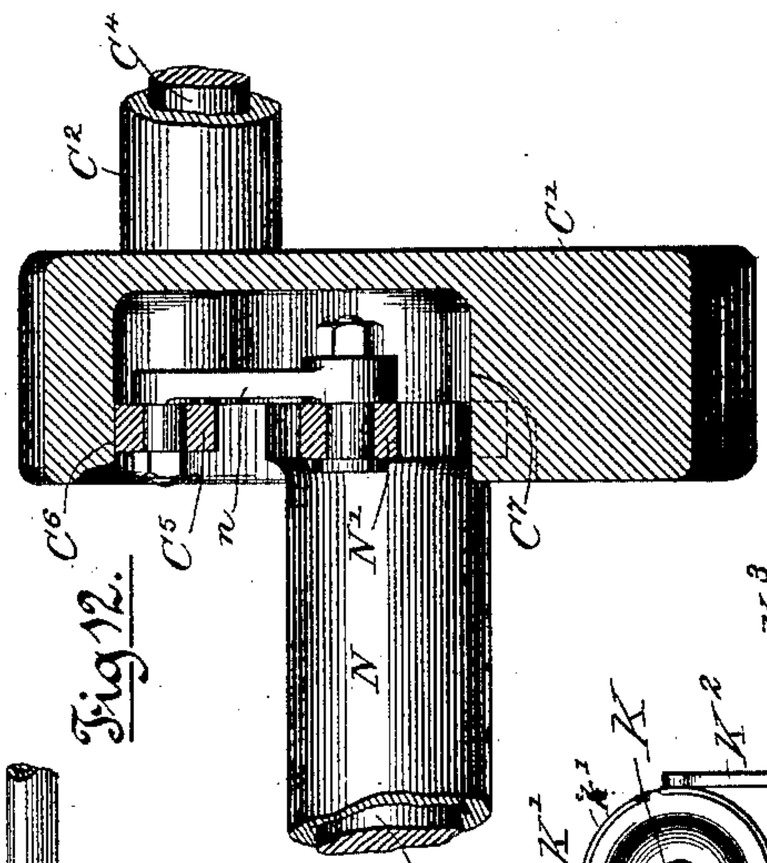


Fig. 12.

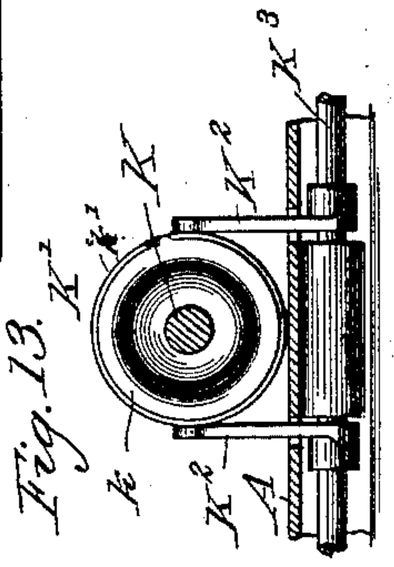


Fig. 13.

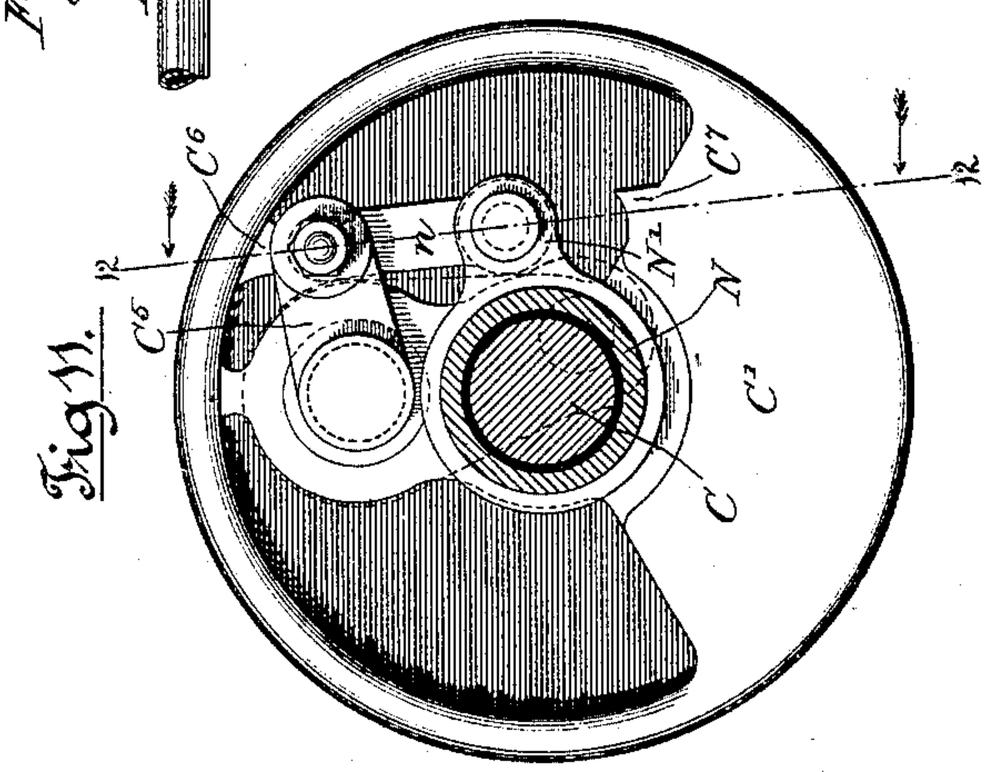


Fig. 11.

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UNITED STATES PATENT OFFICE.

MILAN C. BULLOCK, OF CHICAGO, ILLINOIS.

HOISTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 462,299, dated November 3, 1891.

Application filed May 20, 1889. Serial No. 311,472. (No model.)

To all whom it may concern:

Be it known that I, MILAN C. BULLOCK, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Hoisting-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a novel steam hoisting machine or engine adapted, primarily, for use in earth or rock boring or sinking wells, but also adapted for other hoisting purposes.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

The machine herein shown as embodying my invention comprises both a windlass or hoisting apparatus and an engine for actuating the same, these parts being combined in a single structure so as to afford a machine of great convenience in use and one which is at the same time compact, simple, and economical in construction.

In the accompanying drawings, illustrating my invention, Figure 1 is a plan view of a machine embodying several features of my invention. Fig. 2 is an end elevation thereof, showing the steam-cylinders. Fig. 3 is a central longitudinal section taken upon line 3 3 of Fig. 1. Fig. 4 is a detail section showing a part of the gearing of the machine, taken upon line 4 4 of Fig. 3. Fig. 5 is a detail section showing gearing of the machine, taken on line 5 5 of Fig. 3. Fig. 6 is a side view of the machine, showing a swivel-head applied by the machine-frame. Fig. 7 is an elevation of that end of the machine opposite that one at which the engine-cylinders are located. Fig. 8 is a detail section taken upon line 8 8 of Figs. 1 and 6. Fig. 9 is an enlarged detail section through the crank-shaft bearing the crank-disk and adjacent parts. Fig. 10 is a detail cross-section taken upon line 10 10 of Fig. 9. Fig. 11 is an inside face view of the crank-disk. Fig. 12 is a sectional view of the same, taken upon line 12 12 of Fig. 11. Fig. 13 is a fragmentary end view of the devices for shifting the pinion shown in the lower right-hand portion of Fig. 3. Fig. 14 is a detail plan view of the throttle-valve and a portion of its actuating mechanism.

As illustrated in said drawings, the engine-frame comprises a massive cast-metal base or bed plate A, rectangular in plan view, upon opposite ends of which are cast parallel upright frame-standards A′ A^2. In said frame are cast or formed the bearings for the several operative parts of the machine. The frame-arms A′ A^2 are connected near their upper ends by means of two horizontally-arranged parallel cylindric bars or girts A^3 A^4, secured at their ends to the said standards in the manner illustrated.

B B indicate the steam-cylinders, which are secured to the frame-standard A^2 near the base of the machine, and with their central axial lines inclined toward each other in such manner as to intersect near the top of the machine.

B′ B′ are cross-head guides, herein shown as made of tubular form and cast integral with the frame-standard, and *b b* are cylinder-heads also cast integral with the frame and to which the cylinders are bolted at their upper ends, thereby forming a simple and convenient means of securing the cylinders to the machine-frame.

C is a crank-shaft, which is supported at its ends in bearings *a a′* in the upper parts of the frame-standards A′ A^2, respectively. Said crank-shaft is provided at its end outside of the bearing *a′* adjacent to the cylinders with a crank-disk C′, which is provided with a crank-pin C^2, herein shown as made tubular, for a purpose hereinafter stated. D D are the connecting-rods of the engine-cylinders, both of which engage the crank-pin C^2, one of said rods being shown as forked at its part engaged with the crank-pin to allow the engagement of the end of the other rod with the crank-pin between the prongs thereof, as clearly shown in Fig. 1.

B^2 B^2 are steam-chests located at the outer faces of the cylinders, and *b′ b′* are valve-stems, which are attached to cross-heads b^2 b^2, sliding on guides b^3 b^3 upon the ends of the steam-chests. To said cross-heads b^2 b^2 are pivoted valve-connecting rods D′ D′, which engage at their upper ends a crank-pin *c* upon a crank-arm C^3, attached to a shaft C^4, Fig. 9, which is arranged concentrically with and

passes through the tubular crank-pin C^2 of the main crank-disk. The crank-pin *c* stands normally eccentric to the main shaft, so as to give a desired motion to the valve in the same manner as an ordinary eccentric. The crank-arm C^3 is, however, adapted to be swung or oscillated about the axis of the main crank-pin through a certain arc, so as to change the position of the eccentric crank-pin *c* to one side or the other of the shaft for the purpose of reversing the engine.

A reversing-gear is provided for effecting the shifting of the eccentric crank-pin for reversing the engine, as will be hereinafter fully described. The end of the shaft C opposite that to which the crank-disk is attached is extended beyond the bearing *a* in the frame-standard and is adapted to receive a small windlass-drum, such as is shown at C^8 in Fig. 3, or a beveled gear-wheel for actuating a drill-rod, such as is shown in Fig. 6. The frame-standard A′ is provided with an annular seat A^5, Figs. 3, 6, and 7, concentric with the shaft C to receive the swivel-head of a rock-drilling apparatus, such as is indicated at A^6 in Figs. 6 and 7. I have herein shown only the swivel-head proper and the driving-gear of the rock-drilling apparatus, the other parts of the same being made in any desired or preferred manner.

An illustration of a drilling apparatus capable of use with the engine shown is contained in Letters Patent No. 443,819, granted to me December 30, 1890.

E indicates a winding-drum, which is located between the frame-arms A′ A^2 beneath the crank-shaft C, and is mounted on a shaft F, which is supported at its ends in bearings a^2 a^3 in the frame-standards A′ A^2. Said drum E is not fixed to the shaft F, but is adapted to turn thereon, being provided for this purpose with the hubs *e e*, extending inwardly from the ends or heads and babbitted to afford suitable bearings for the shaft.

Several different gears are provided for actuating the winding-drum from the shaft C to afford different degrees of speed and power in the drum and which will now be described.

G is a spur-wheel mounted upon the shaft F and rigidly affixed thereto. Within the hub G′ of said wheel are formed one or more guide-apertures *g g*, in which are placed sliding pins *g′ g′*, arranged parallel with the shaft and adapted to engage holes *e′ e′* in the adjacent head of the drum E. The pins *g′ g′* are secured in longitudinally-sliding sleeves G^2, mounted on a cylindric extension of the hub G′. Said sleeve G^2 is grooved and carries a ring g^2, which is engaged with the forked end of an actuating-lever G^3, attached to a horizontal rock-shaft G^4, mounted in the frame of the machine. Attached to said rock-shaft at one side of the frame is a hand-lever G^5, by which the same may be actuated. The pins *g g* and devices for actuating them, above described, constitute a clutch device for detachably connecting the spur-wheel G with the drum E.

H is a gear-wheel mounted upon the frame-girt A^4 adjacent to the frame-standard A′, and H′ is a gear-pinion attached to or made in one piece with the gear-wheel H. The said gear wheel and pinion are not mounted directly upon the girt, but are adapted to turn on a sleeve H^2, having an eccentric aperture through which the girt passes, Fig. 4.

Attached to the end of the eccentric sleeve H^2, which projects beyond the face of the pinion H′, is a lever H^3, Figs. 1 and 8, by which the sleeve may be partially rotated. The said sleeve is so located and the pinion is of such size that when the eccentric sleeve is turned into one position, as shown in Fig. 4, the pinion will intermesh with the spur-wheel G, but when turned part way around the pinion will be free from said spur-wheel. A sliding pin or catch *h*, passing through a stationary flange *h′* on the girt A^4 and entering one of two holes in the end of the eccentric sleeve, serves to lock the same in position when the pinion is engaged with or disengaged from the spur-wheel.

I is a pinion mounted on the shaft C and adapted to slide endwise on said shaft, so that it may be brought into mesh either with the spur-wheel G or the gear-wheel H, said wheels G and H being located equidistant from the shaft, in order that they may both intermesh with the same pinion. Said pinion I is attached to a sleeve I′, which is arranged to slide endwise on the shaft, but is held from turning thereon by means of a spline *i* on the shaft engaging a groove or feather-way in the sleeve, in the manner illustrated. The sleeve is locked or held from endwise movement on the shaft when in a desired position by means of a sliding pin *i′* in the sleeve, which is adapted to engage either one of a plurality of holes *c′ c′*, formed in the shaft to receive the same.

The gearing above described affords means for driving the hoisting-drum at two different speeds. When the pinion I is in position to mesh with the spur-wheel G and the sleeve H^2 is turned to free the pinion H′ from said spur-wheel, then the gear-wheel H and pinion H′ are entirely out of action and the spur-wheel G is actuated directly from the shaft, thereby giving a speed in the drum depending on the relative sizes of the wheel G and pinion J. By shifting the pinion I endwise it may be released from the spur-wheel G and brought into mesh with the gear-wheel H, and when the pinion is thus shifted and the sleeve H^2 turned to bring the pinion H′ into mesh with said spur-wheel G motion will be transmitted from the shaft to the drum through the medium of said pinion I and gear-wheel H and the pinion H′ and spur-wheel G. When the parts are thus arranged, the drum is driven with much slower speed and greater power than when it is actuated

from the shaft by the pinion I and spur-wheel G. It will of course be understood that when the drum is being driven by the gearing described the clutch-pins *g* will be engaged with the drum, so that the latter will be rigidly connected and turn with the spur-wheel G.

At the end of the drum E opposite the spur-wheel G said drum is provided with a cylindric flange E′, having on its inner surface a series of gear-teeth E^2, and mounted upon said shaft between the hub *e* of the drum and the bearing a^3 is located a gear-pinion J, which is arranged in the same plane with the gear-teeth E^2. Said pinion J is keyed to the shaft and turns with the latter at all times.

K is a stud or bearing-pin mounted on the frame parallel with the shaft F and extending inwardly between the pinion J and the gear-teeth E^2. Said stud is herein shown as sustained at its outer end upon an upwardly-projecting arm or bracket A^7, cast upon the frame-base A and supported by its inner end by a bracket A^8, attached to the frame-standard A^2, as shown in Fig. 2. Mounted upon said stud K is a gear-pinion K′, adapted to slide longitudinally and rotate upon the stud. Said gear-pinion has an endwise-sliding movement upon the stud and is adapted when shifted to its inward position to engage both the gear-teeth E^2 and pinion J, while when slid back to its outer position it is free from said pinion and gear-teeth, as shown in Fig. 3. As a means of conveniently sliding or shifting the pinion K′, said pinion is provided on its outer end with a cylindric extension *k*, containing an annular groove, within which is placed a ring *k*′. Said ring is engaged by the forked ends of an actuating-lever K^2, attached to a horizontal shaft K^3, which is mounted within the frame, as shown in detail in Fig. 13. A hand-lever K^4, attached to the end of the shaft at one side of the frame, enables the same to be easily turned for shifting the position of the pinion K′. When said pinion K′ is engaged with the pinion J upon the shaft F and with the gear-teeth E^2 of the drum and the shaft is revolved, the drum will be driven from the shaft at a speed slower than that of the shaft, depending upon the relative size of the pinion J and the flange E′ of the drum. When the drum is driven from the shaft in the manner described, the spur-gear G will be disconnected from the drum by shifting of the clutch-pins *g*′ to free the same from the apertures in the head of the drum, so that the drum will be free to turn upon the shaft instead of turning with the shaft, as is the case when the spur-wheel G and drum are connected with each other by the clutch-pins. When it is desired to drive the drum with greater power than is afforded by the use of the gears I, H, and H′, the sliding pinion K′ is thrown into gear with the pinion J and gear-teeth E^2, the clutch-pins *g*′ are retracted to free them from the drum, and the pinion I is moved upon the shaft C to bring it into mesh with the spur-wheel G. Said spur-wheel and the shaft F will be turned by the action of the said pinion I and the motion of the shaft will be transmitted through the pinions J and K′ to the drum, thereby turning the drum at a slower speed but greater power than before by reason of the fact that motion is transmitted by the action of two relatively small gear-wheels—namely, the pinions I and J—acting upon two large gear-wheels—to wit, the spur-wheel G and the toothed flange E′ of the drum. In case still greater power is needed in the drum than is afforded by engagement of the gears in the manner described, the gear-wheel H and pinion H′ may be brought into action to transmit motion from the shaft C to the spur-wheel G, in the same manner as hereinbefore stated.

For the purpose of controlling or checking the rotation of the drum E in allowing the rope to unwind from the drum or under other circumstances a brake device is provided, which is constructed as follows: L is a brake-strap placed around the cylindric flange E′ of the drum. At one side of the drum said strap is attached to a casting L′, which is connected by means of a link L^2 with the frame-base A, said link being pivotally connected at its ends both with the frame-base and casting L′ in the manner illustrated in Fig. 5. The adjacent ends of the brake-strap L are provided with outwardly-extending lugs *l l*′, through which is inserted a clamping-rod L^3. Said rod is pivotally connected at one end by means of a pivot-pin l^2 with an eccentric block l^3, which bears upon a concave seat l^4, resting against the lug *l*′, and is provided with a rigidly-attached actuating handle or lever L^4. Upon the said rod L^3 is placed a nut l^5, which bears against the lug *l* and by which the tension of the brake-strap may be adjusted. By means of the lever L^4 the eccentric block l^3 may be turned, thereby drawing the nut l^5 of the rod against the lug *l* and bringing or forcing together the ends of the brake-strap to clamp the latter about the flange of the drum in a manner heretofore common and well understood. In order to hold the rod L^3 and the lower part of the brake-strap in position, said rod L^3 is desirably connected by a screw-threaded joint at its lower end with the base-plate A of the machine-frame. Said plate is herein shown as provided with a tubular projection a^4, which is engaged by the rod, and the latter is shown as provided with a jam-nut l^6, clamped against the projection of the frame to hold the rod from turning after it is brought to the desired position.

The utility of the machine constructed as above described will be rendered more apparent from the following: In a machine of ordinary size in which the parts are proportioned about as shown in the drawings, when the pinion I is in mesh with the gear spur-wheel G and the other gears are out of action, a load of two thousand two hundred pounds may be hoisted at a speed of four hundred

feet per minute. After the load is lifted by applying the brake-strap the load may be held while the clutch is actuated to release the said spur-wheel from the drum. The brake may then be released and the drum allowed to freely revolve to unwind the rope. When operated in this manner, the machine may be used to operate a driving weight or hammer in driving stand-pipes, the weight in such case falling almost as freely as the hammer of a pile-driver. The devices by which the rope may be rapidly unwound are of great advantage in hoisting drill-rods out of a deep boring, inasmuch as it allows the sheave or clamp which engages the rod to be quickly lowered, and thus saves much time. When the pinion I is engaged with the wheel H and the pinion H′ with the spur-wheel G, a load of four thousand three hundred pounds may be lifted at a speed of two hundred feet per minute, while by actuating the clutch the drum may revolve to allow the unreeling of the rope as rapidly as before. When the gears are as last above described and the wheel is disengaged from the drum, while the sliding pinion K′ is thrown into action, six thousand two hundred pounds may be hoisted at a speed of one hundred and forty feet per minute. By holding the weight of the load by the brake and then throwing said pinion K′ out of gear the drum will freely revolve upon releasing the brake. By the use of blocks or sheaves a much larger load may be lifted at a slower speed, as in the use of other hoisting-machines.

The hoisting apparatus made as above set forth is of great utility and affords a large saving of time in lowering drill-rods as well as in hoisting the same. By using the combination of gears first above referred to, for instance, the block may be hoisted quickly into position to take hold of and lower a section of drill-rod, while the lowering may be accomplished rapidly by detaching the hoisting-drum from the gearing and controlling its movement by the brake. In all other machines in use, as far as I am aware, as much time is required to wind up the rope and hoist the block back to the top of the derrick ready to take hold of the next section of drill-rod as it does to hoist a heavy load. With the machine described not only can the load or block be rapidly lowered, but the same may be hoisted at a high speed.

The reversing-gear which operates the eccentric crank-pin *c* is more clearly shown in Figs. 1, 3, 9, 10, 11, and 12, and will now be described. To the inner end of the shaft C^4, to which the crank-arm C^3 of the eccentric crank-pin is attached and which passes through the main crank-pin C^2 in the manner hereinbefore described, is attached a crank-arm C^5, desirably located at the inner face of the crank-disk C′. The end of the shaft C adjacent to the crank-disk does not rest directly in the bearing *a*′, but a short tube or sleeve N is inserted between the shaft and bearing and extends outside of or beyond the bearing at either side of the same, said sleeve being adapted to turn independently of the shaft. At the end of the sleeve adjacent to the crank-disk said sleeve is provided with an outwardly-projecting rigid arm N′, arranged approximately parallel with the arm C^7 of the shaft C^4 and connected with the same by means of a link *n*. At the other end of the bearing *a*′ the sleeve N is enlarged, forming a barrel or cylindric shell N^2, which is considerably larger in the inside diameter than the shaft. Attached to the shaft, inside of the shell N^2, is a sleeve O, Figs. 9 and 10, which sleeve is adapted to slide lengthwise on the shaft, but is held from turning thereon by means of splines *o o* in the shaft engaging grooves *o*′ in said sleeve O. Upon said sleeve O are formed two spiral flanges O′ O′, herein shown as located at opposite sides of the sleeve. Said fingers engage notches *n*′ *n*′, formed within an inwardly-projecting annular rib or flange of the shell N^2. As a convenient way of forming such notches *n*′ *n*′, the parts are herein shown as constructed as follows: N^3 N^3 are two nearly semicircular castings or segments fitted within the open end of the shell N^2, with their adjacent ends at such distance apart as to form the notches *n*′ *n*′. In other words, the end faces of the said segmental castings N^3 N^3 are constructed to form bearing-surfaces acting against the sides of the spiral flanges O′ O′. Said segmental castings N^3 N^3 are conveniently held in place within the shell N^2 by means of screws n^2 n^2, inserted through the cylinder and engaging the castings. The shell N^2 is herein shown as split or slotted for some distance inwardly from its open end in the same plane, or nearly so, with the notches *n*′ *n*′, and is provided with lugs n^3 n^3, located at either side of said slots. Bolts n^4 n^4 are inserted through said lugs, by which the opposite sides of the shell may be clamped or drawn together. This construction is used as a convenient way of closing the end of the bearing-surfaces of the segments N^3 N^3 against the spiral flanges to compensate for wear in the parts. The sleeve O is prolonged to extend outside of the shell N^2, and upon the projecting part of the sleeve is secured a ring o^2, which is rigidly affixed thereto, together with another ring o^3, held by screw-threaded engagement with the sleeve, said rings o^2 o^3 forming an annular groove, within which is located a ring O^2, which is adapted to turn freely upon the sleeve. In said ring O^2 are secured two radial pins o^4 o^4, by means of which an actuating-lever may be connected with the said ring O^2 for moving the sleeve O endwise on the shaft. Such an actuating-lever is shown at O^3 in Fig. 1, the same being pivotally supported upon the frame-girt A^3 and arranged approximately in a horizontal position, so that its end which is grasped by the hand extends to one side of the machine in position convenient for the operator. In the particular con-

struction of these parts illustrated the lever O^3 is connected directly with the pins o^4, and said lever is pivotally connected with the frame-girt A^3 by means of a link o^5, allowing necessary endwise movement of the lever as the same is moved to shift the sleeve O'. A notched segment O^4 is attached to the girt A^3 and operates in connection with a hand detent O^5 on the lever to lock the same in any position in which it is placed. The sleeve O turns with the shaft C, and by its engagement with the sleeve N, through the medium of the spiral flange O', causes the said sleeve N to also turn with the shaft. By shifting the said sleeve O endwise upon the shaft, however, the spiral flanges, acting upon the notches of the shell N^2, turn the said sleeve relatively to the shaft an angular distance, depending on the inclination of the flanges. As herein shown, the sleeve N is turned to only about one-eighth of a revolution of the shifting of the sleeve. When the sleeve N is turned by endwise movement of the sleeve O in the manner described, the shaft C^4 will also be turned by reason of the connection between the said sleeve and shaft afforded by the arms N' and C^5 and the connecting-link n, Fig. 11. This turning of the shaft C^4 will have the effect of swinging the eccentric crank-pin from one side to the other of the central axis of the crank-shaft. The throw of the eccentric crank-pin when thus moved is so limited as to give the desired degree of eccentricity for actuating the valves at each limit of its throw, it of course being understood that when the eccentric crank-pin is at one limit of its throw the engine will be driven in one direction and when shifted to the opposite limit of its throw the engine will be reversed. The parts are preferably so arranged, furthermore, that the strain upon the eccentric crank-pin, produced by the working of the valves when the engine is turning in one direction, will tend to draw the same toward that limit of its movement at which it stands when the crank-shaft is being turned in that direction. In other words, when the crank-shaft is being driven to the right the resistance of the valves will tend to carry or drag the eccentric-pin into position to continue the movement of the shaft in the same direction. In connection with the eccentric-pin thus arranged I have located upon the crank-disk a stop or projection C^6, against which the arm C^5, Fig. 11, is adapted to strike when the engine is turned forwardly, so that all strain tending to turn the crank-shaft C^4 a greater distance comes upon said stop instead of upon the reversing-gear. A similar stop C^7 is arranged to engage the arm N' at the opposite limit of the movement of the eccentric crank-pin or when the engine is running backward. I have herein shown the crank-disk C' as recessed on its rear or inner face to contain the arms C^5 and N' and adjacent parts. The reversing mechanism described is of great advantage as employed in connection with the hoisting-engine illustrated, for the reason that it affords a cheap and simple construction in the parts and enables the engine to be easily controlled by the operator standing at a point near the winding-drum of the engine.

Q is a rock-shaft located in the frame-base A at one side of the latter and provided with a hand-lever Q', extending upwardly through the base in position convenient for the operator. A second hand-lever Q^2 is pivoted upon the opposite side of the frame and is adapted to operate said rock-shaft, being connected with the same by means of a rod q, Fig. 3, which is connected with a depending arm q' upon the said shaft Q. Said shaft Q extends outside of the frame adjacent to the steam-cylinders of the engine and is provided at its end with a crank-arm q^2, which is connected at its free end by means of a pitman q^3 with a lever which actuates the throttle-valve R of the engine, as shown in detail in Fig. 14. This construction enables the steam to be shut off from the engine at desired times by the person operating the machine without leaving his post at the side of the hoisting-drum. The throttle-valve is herein shown as located in a steam-pipe R', provided with branches R^2 R^2, leading to the steam-chests B^2 B^2. R^3 R^3 are exhaust-pipes leading from the steam-cylinders to a main exhaust-pipe R^4.

I have herein shown the sleeve I' upon the shaft C as provided with a sprocket-wheel I^2, which may be used for driving a hydraulic pump in case a drilling apparatus having hydraulic feed is used or for giving motion to any other machine or apparatus, which is found necessary or desirable to operate by means of the power obtained from the steam-cylinders of a hoisting-engine.

I do not claim in this application the improvements in steam-engines and reversing-gear therefor, as herein described, as such apparatus is fully described and claimed in another application for Letters Patent, Serial No. 336,866, filed by me in the United States Patent Office, January 14, 1890.

I claim as my invention—

1. A hoisting-engine comprising, as a single structure, an engine-frame provided at its opposite ends with frame-standards, a crank-shaft mounted in the upper ends of said frame-standards, engine-cylinders attached to the outer face of one of the standards, a hoisting-drum located within the space between the frame-standards below the crank-shaft, gearing connecting said crank-shaft with the hoisting-drum, and a swivel-head mounted upon the exterior face of the other frame, substantially as described.

2. A hoisting-engine comprising a frame, a crank-shaft mounted therein, a winding-drum, a shaft supporting the same, adapted to turn both in the winding-drum and in the frame, a spur-wheel affixed to the drum-shaft, gearing connecting the crank-shaft with said spur-

wheel, and a clutch connecting said spur-wheel with the drum, substantially as described.

3. A hoisting-engine comprising a frame, a crank-shaft mounted therein, a winding-drum, a shaft supporting the same, adapted to turn both in the winding-drum and in the frame, a spur-wheel affixed to the drum-shaft, a pinion on the crank-shaft engaging said spur-wheel, and a clutch connecting said spur-wheel with the drum, substantially as described.

4. A hoisting-engine comprising a frame, a crank-shaft mounted therein, a winding-drum, a shaft supporting the same, adapted to turn both in the drum and in the frame, a spur-wheel affixed to the drum-shaft, gearing connecting the crank-shaft with said spur-wheel, a clutch connecting the spur-wheel with the drum, and a brake acting upon said drum, substantially as described.

5. A hoisting-engine comprising a frame, a crank-shaft, a winding-drum, a shaft supporting the drum, constructed to turn both in the drum and in the frame, a spur-wheel affixed to the drum-shaft, a clutch connecting said spur-wheel with the drum, a gear-wheel mounted on the frame adjacent to the shaft, a pinion attached to said gear-wheel, adapted to engage the said spur-wheel on the drum-shaft, and a sliding pinion on the crank-shaft, adapted to engage either the spur-wheel on the drum-shaft or the said gear-wheel on the frame, substantially as described.

6. A hoisting-engine comprising a frame, a crank-shaft, a winding-drum, a shaft supporting the drum, constructed to turn both in the drum and in the frame, a spur-wheel affixed to the shaft, a clutch connecting said spur-wheel with the drum, a gear-wheel mounted on the frame adjacent to the shaft, a pinion attached to said gear-wheel, adapted to engage the said spur-wheel on the drum-shaft, and a sliding pinion on the crank-shaft, adapted to engage either the spur-wheel on the drum-shaft or the said gear-wheel on the frame, and an eccentric shaft mounted on the frame and supporting said gear-wheel and its attached pinion, by which the latter may be disengaged from the said spur-wheel, substantially as described.

7. A hoisting-engine comprising a frame, a crank-shaft, a winding-drum, a shaft supporting the winding-drum, constructed to turn both in the drum and in the frame, a spur-wheel affixed to the drum-shaft, gearing connecting said crank-shaft with the spur-wheel, a pinion affixed to the said shaft, said drum being provided with internal gear-teeth opposite the pinion, and a sliding pinion upon the machine-frame, adapted to engage the pinion upon the drum-shaft and the internal gear-teeth of the drum, substantially as described.

8. The combination, with the frame of a hoisting-machine, of a hoisting-drum supported in the frame, steam-cylinders attached to the outer face of the frame, a throttle-valve controlling the admission of steam to the cylinders, a rock-shaft mounted in the frame and connected with the throttle-valve, and two hand-levers located at opposite sides of the machine and both connected with and operating the said rock-shaft, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

MILAN C. BULLOCK.

Witnesses:
C. CLARENCE POOLE,
HARRY COBB KENNEDY.