(No Model.) 3 Sheets—Sheet 1.

L. D. ENNES.

WELL DRILLING MACHINE.

No. 572,973. Patented Dec. 15, 1896.

Fig. 1.

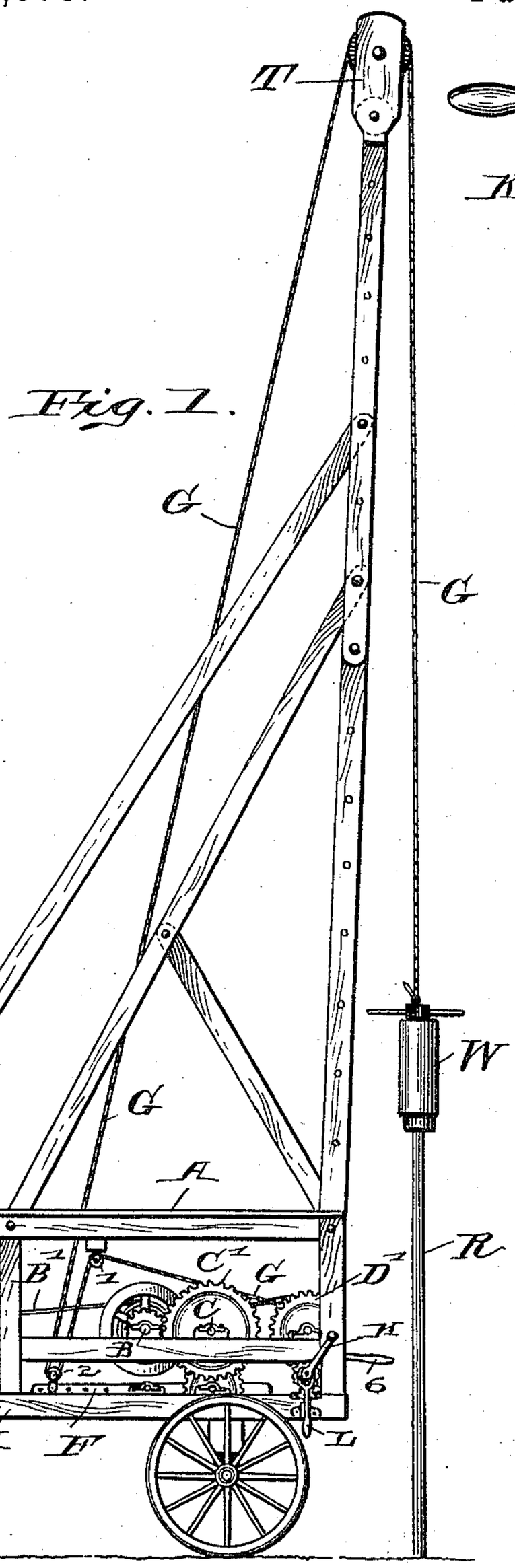


Fig. 7.

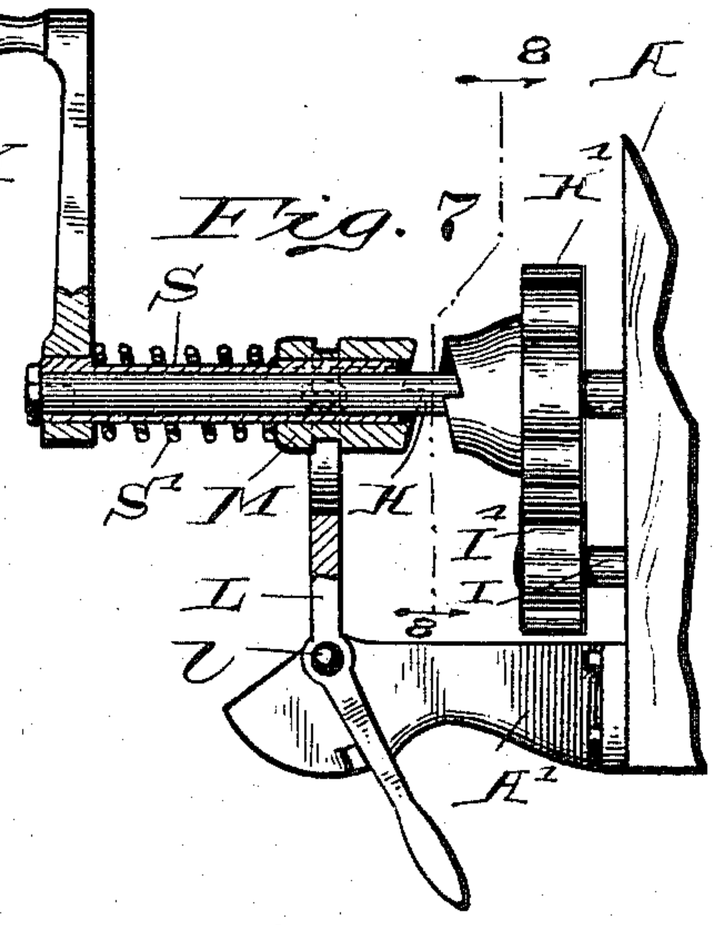
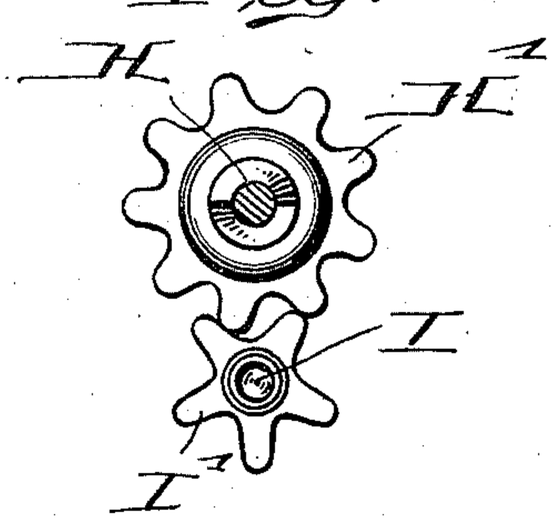


Fig. 8.



WITNESSES:

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(No Model.)

3 Sheets—Sheet 2.

L. D. ENNES.

WELL DRILLING MACHINE.

No. 572,973. Patented Dec. 15, 1896.

Fig. 2.

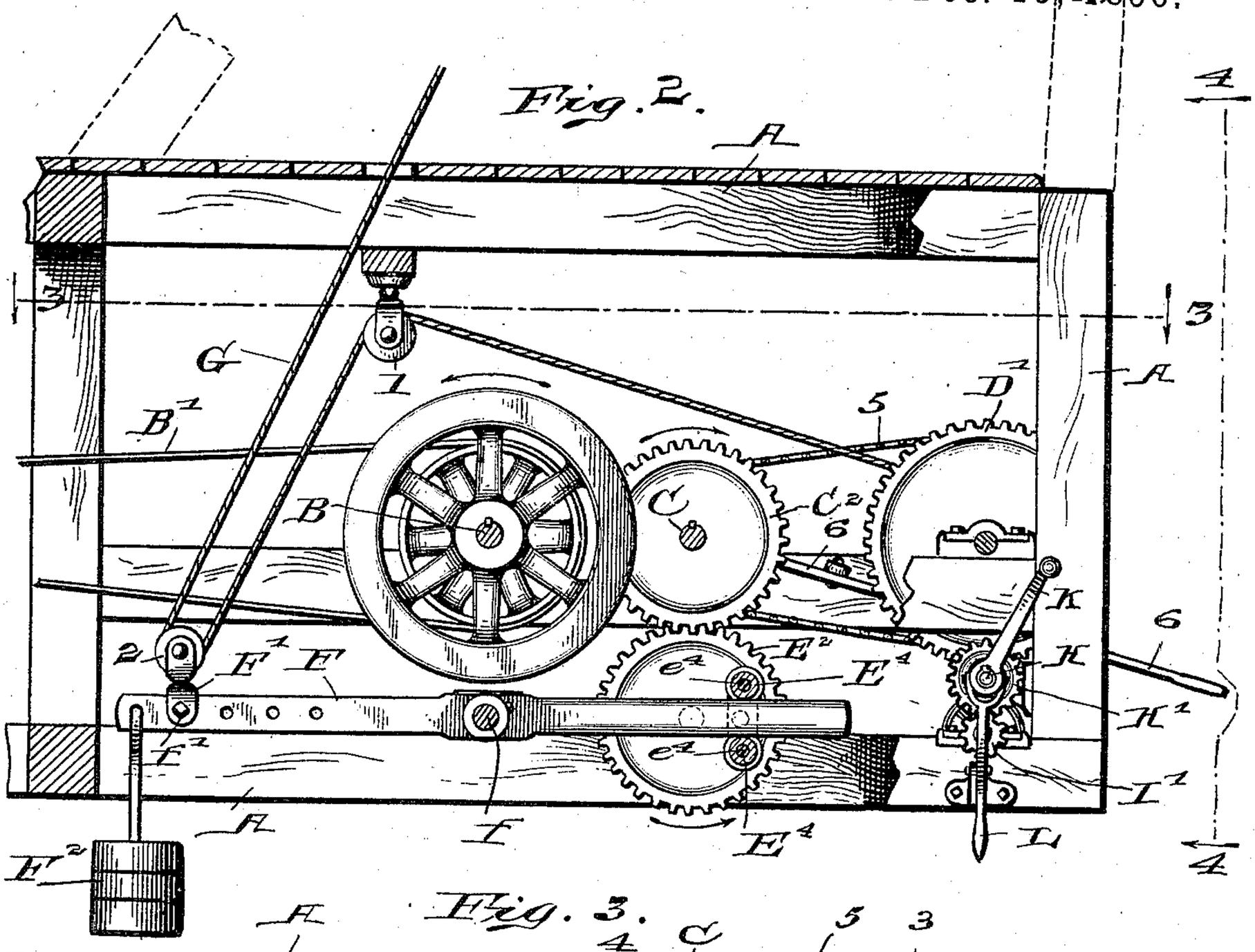
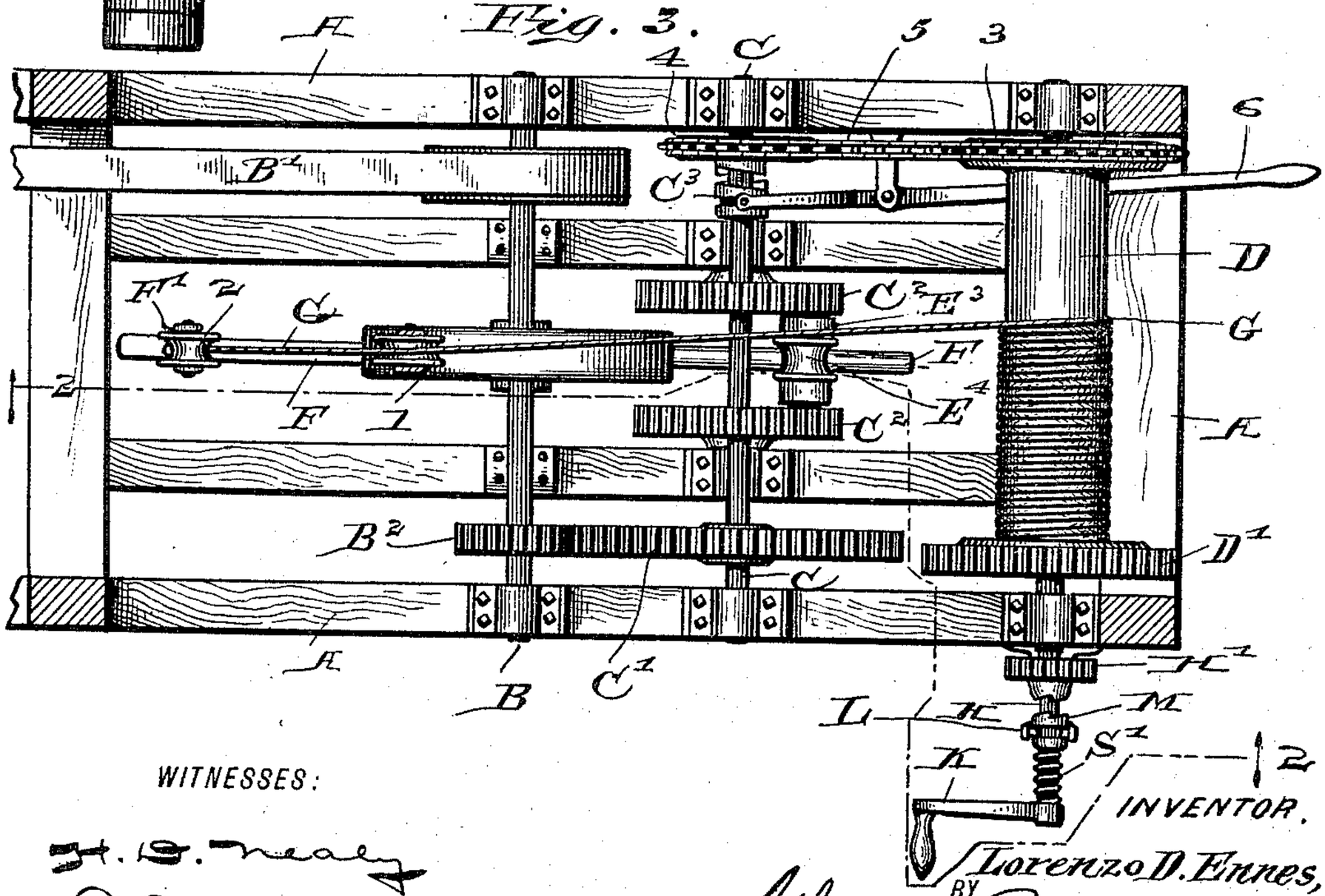


Fig. 3.



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(No Model.) 3 Sheets—Sheet 3.

L. D. ENNES.

WELL DRILLING MACHINE.

No. 572,973. Patented Dec. 15, 1896.

Fig. 4.

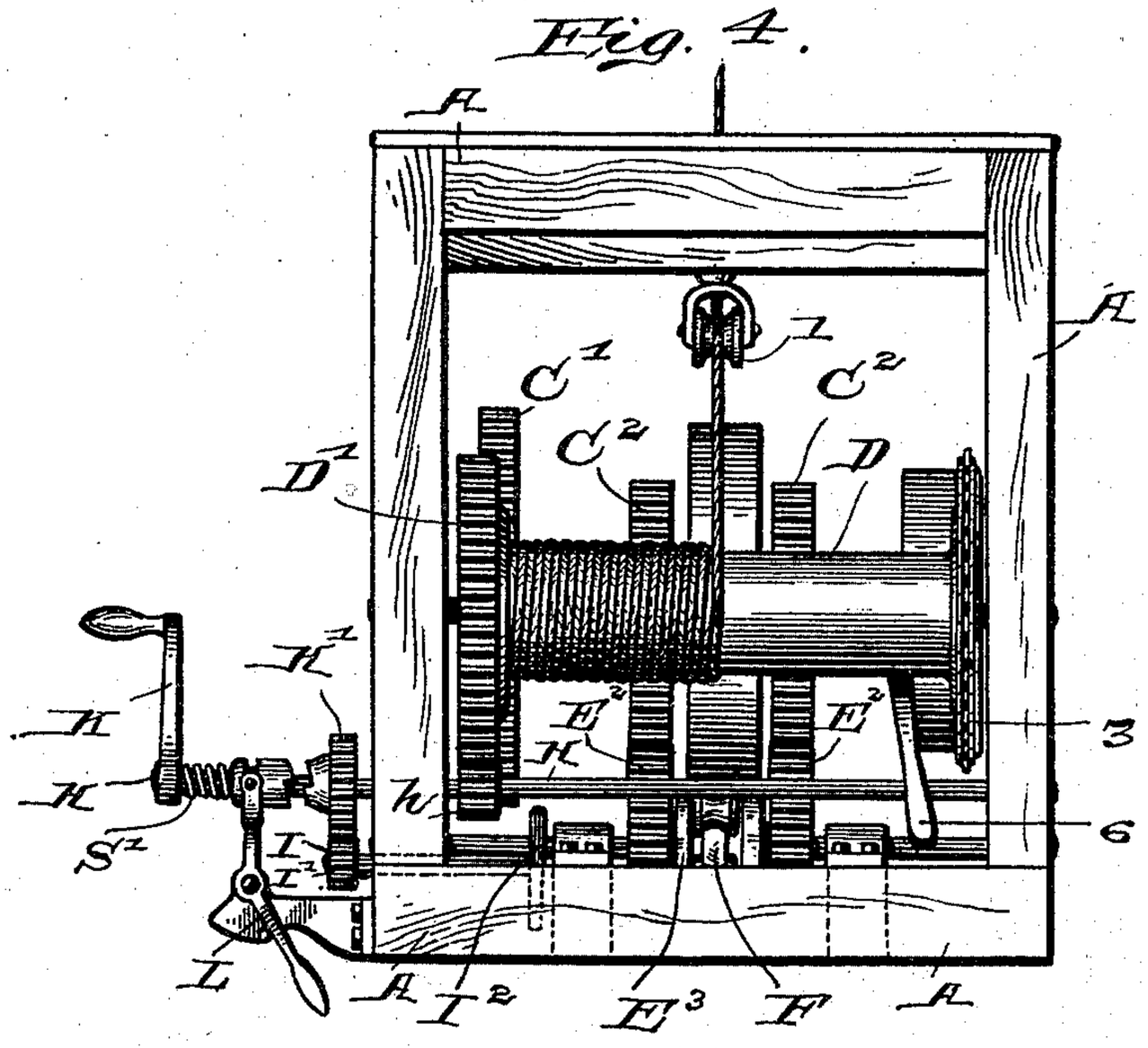


Fig. 5.

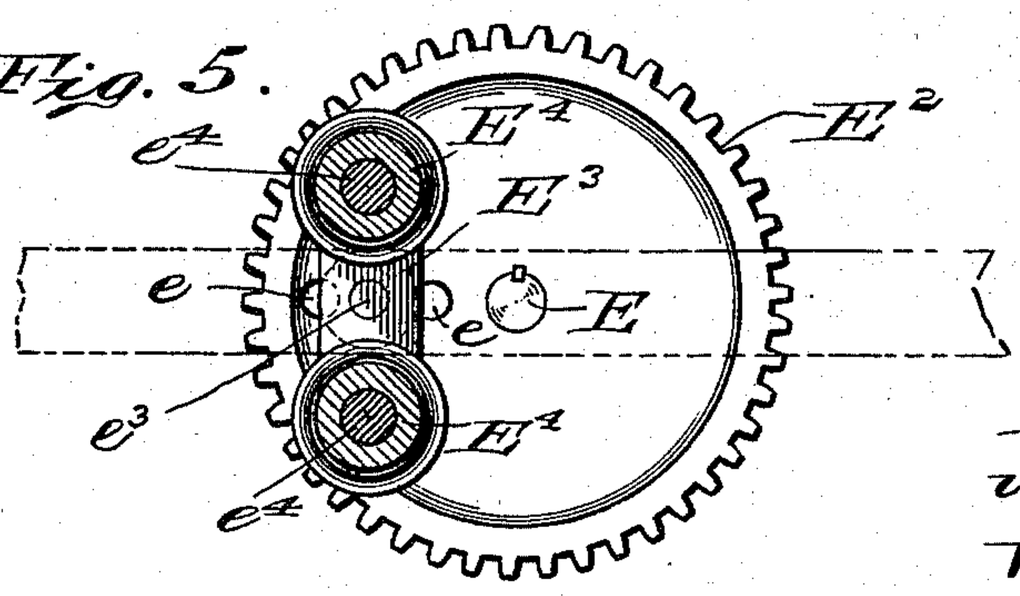


Fig. 6.

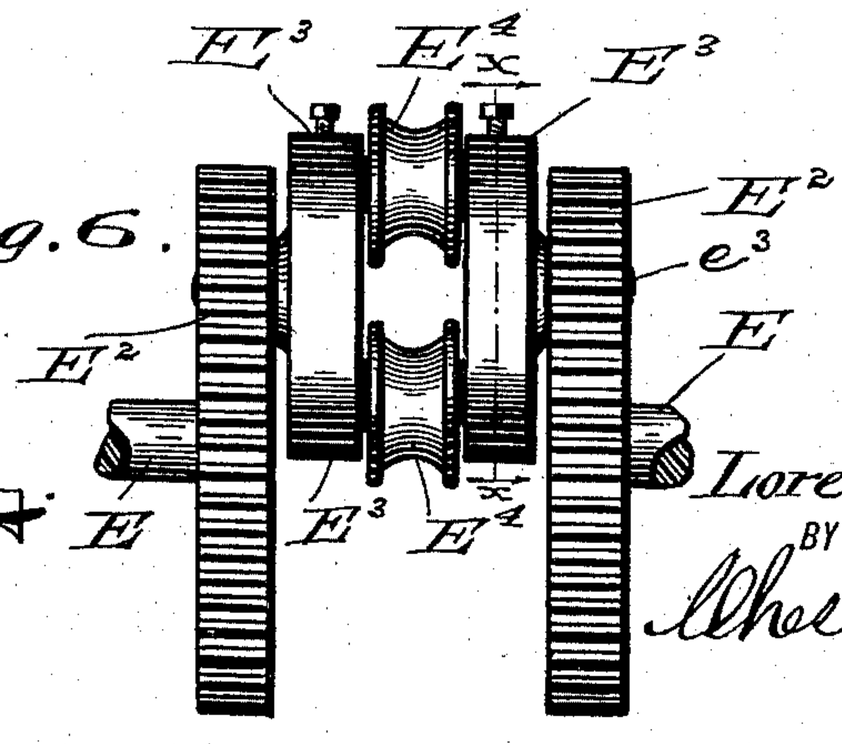
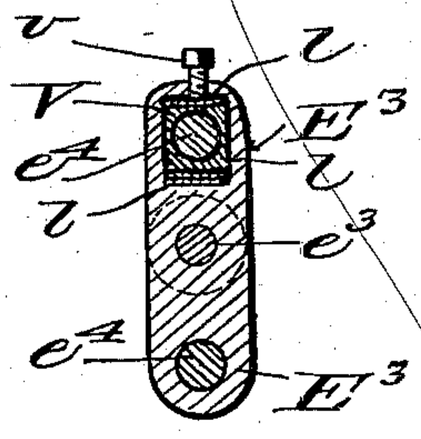


Fig. 6ª.



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UNITED STATES PATENT OFFICE.

LORENZO D. ENNES, OF LYONS, INDIANA, ASSIGNOR TO CARRIE C. ENNES, OF SAME PLACE.

WELL-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 572,973, dated December 15, 1896.

Application filed March 13, 1896. Serial No. 582,995. (No model.)

To all whom it may concern:

Be it known that I, LORENZO D. ENNES, a citizen of the United States, residing at Lyons, in the county of Greene and State of Indiana, have invented certain new and useful Improvements in Well-Drilling Machines, of which the following is a specification.

My present invention consists in certain features in the mechanism of that class of machinery known as "well-drilling" machines, whereby their efficiency and simplicity are increased.

A machine embodying my said invention will be first fully described, and the novel features thereof then pointed out in the claims.

Referring to the accompanying drawings, which are made a part hereof and on which similar letters and numerals of reference indicate similar parts, Figure 1 is a side elevation of a machine embodying my said invention; Fig. 2, a longitudinal sectional view, on an enlarged scale, as seen when looking in the direction indicated by the arrows on the dotted line 2 2 in Fig. 3; Fig. 3, a horizontal sectional view looking downwardly from the dotted line 3 3 in Fig. 2; Fig. 4, an end elevation of the machine as seen from the dotted line 4 4 in Fig. 2; Fig. 5, a detail sectional view on a still further enlarged scale, illustrating more clearly that feature of the drill-operating mechanism by which the drill weight or rod is raised and lowered; Fig. 6, an edge elevation of the parts shown in Fig. 5; Fig. 6ª, a detail sectional view on the dotted line $x\,x$ in Fig. 6; Fig. 7, a detail partially-sectional view of the "letting-off" mechanism; and Fig. 8, a detail view of the intermeshing wheels shown in Fig. 7, as seen from the dotted line 8 8 therein.

In said drawings the portions marked A represent the framework of the machine; B, the main driving-shaft; C, an intermediate shaft; D, the rope-winding drum; E, the drill-rope-operating shaft; F, the walking-beam; G, the rope; H, a windlass-shaft for winding the drum, and I the hand-wheel shaft for slowly operating the windlass-shaft.

In this machine the framework may be of any usual or desired form, and the driving-shaft B may be driven by means of a suitable belt B′ from any suitable source of power, such as a small upright engine, as shown in Fig. 1. This main shaft, through the spur-gear B^2 and the corresponding spur gear-wheel C′, drives the shaft C. Said shaft C, through the spur gear-wheels C^2 and the spur gear-wheels E^2, drives the rope-operating shaft E. Through the clutch C^3, the sprocket-chain 5, and the sprocket-chain wheels 3 and 4 it drives the drum D, said clutch being manipulated by the lever 6.

The shaft E has the pair of spur gear-wheels E^2, between which is hung a swinging frame E^3, carrying the pair of loosely-mounted sheaves E^4, between which sheaves the walking-beam F passes and by which said walking-beam is operated. As illustrated in Fig. 5, the gudgeons e^3 of the frame E^3 may be mounted in either of several bearings therefor, which are shown as in the form of holes e in the web of the gear-wheels. By this means the length of the stroke of said walking-beam may lengthened or shortened, as will be readily understood.

As shown in Fig. 6ª, the bearings for the shaft e^4 of one of the sheaves E^4 are rendered adjustable by means of loose bearing portions V and set-screws v for operating them, so that lost motion may be taken up and wear compensated for. Liners l are preferably inserted in the opening containing the bearing B, and these may be shifted from one side to the other of said bearing as wear or occasion requires. The shafts of both sheaves might, of course, be similarly provided with adjustable bearings, if desired, but I deem this unnecessary, as in the adjustment one sheave is driven toward the other sufficiently by the means shown to secure the adjustment necessary.

The walking-beam F, as shown most plainly in Fig. 2, is mounted on a pivot f on the frame A. One of its ends passes between the sheaves E^4, as just described, while the other end bears the sheave-hanger F′, in which the sheave 2 is mounted on a pivot f' on the frame A. One of its ends passes between the sheaves E^4, as just described, while the other end bears the sheave-hanger F′, in which the sheave 2 is mounted through which the rope G passes. This sheave-hanger F′ may be attached at either of several points on the walk-

ing-beam F, as may be desired, and several holes are shown in said walking-beam to receive the bolt *f'*, by which said hanger is united thereto. A weight F^2 may be provided, as shown in Fig. 2, and suspended from that end of the walking-beam F carrying the sheave 2 for the rope G, and such weight will act as a counterbalance to the drill-rod, thus relieving the machinery of a considerable portion of the strain incident to the lifting of said rod therefor. It does this without reducing the efficiency of the drill-rod in operation, as during the descent of said drill-rod the weight is lifted by the machine and not by said rod, so that by attaching this weight to the walking-beam, instead of direct to the rope, a counterbalancing or partially counterbalancing of the drill-rod during the time it is being lifted is secured without impairing the efficiency of the drill as it descends.

As is well known, the drilling mechanism must include devices whereby the drill-weight W may be raised and let fall or rapidly descend, and various devices for this purpose have heretofore been used. My mechanism for this purpose, which has now been described, as will be readily seen, comprises efficient means for the purpose, which are readily adjustable to almost any extent which may be required, besides which the varying speed of motion which is desirable in such apparatus is secured by means of the loosely-mounted frame E^3, carried by the wheels E^2. Obviously, as said frame ascends, carried by said wheels, (it being farther from the walking-beam pivots *f* than when it descends,) it operates said walking-beam more slowly, and as it pulls on the rope during this ascending movement, the walking-beam serving as a lever and operating over its pivot *f* as a fulcrum, the rope is pulled upon, and the weight W raised comparatively slowly, while, when said frame reaches the other side of the wheel C in its revolution, being much closer to the fulcrum-pivot *f*, the motion of the walking-beam is much more rapid, although the peripheral speed of the devices driving it remains the same. The weight W, while never freed from the rope, is thus given approximately a free drop, so that its impact on the drill-rod R is substantially with its entire force. The distance which the weight shall be raised and let fall is determined both by the adjustment of the loosely-mounted frame E^3 on the wheels E^2 and the adjustment of the sheave-hanger F' on the walking-beam F.

The rope G passes from the drum D over a sheave 1, suspended to the frame A, thence down under the sheave 2, carried by the walking-beam F, and thence to other sheaves in the top T in the derrick structure, and thence to the weight W.

In the operation of drilling it is necessary to slack off the rope gradually and comparatively slowly. To this end a windlass-shaft H is provided bearing a spur-pinion *h*, which engages with a larger spur gear-wheel D' on the end of the winding-drum D, as shown most plainly in Fig. 4. At a point preferably outside the frame A on this windlass-shaft H is a spur-wheel H' of peculiar form, which is loosely mounted thereon and the hub of which has a clutch-face. A sleeve S is mounted on the continuation of the shaft H and has a crank-handle K rigidly mounted thereon at the outer end thereof. At the inner end a clutch member M is mounted on said sleeve and is capable of moving longitudinally thereof while held by a spline or otherwise to revolve therewith. A spring S' surrounds this sleeve between the crank-handle hub and the adjacent end of the clutch member, which is calculated to urge said clutch member into engagement with the clutch-face on the hub of the wheel H'. When said clutch-faces are engaged, manifestly by turning the crank-handle K, the drum D will be wound up, and this is the method employed when it is desired to raise the weight any considerable distance. A lever L is mounted on the pivot on the bracket A', extending out from the frame A, and engages with and is adapted to throw the clutch member M out of engagement, as shown in Fig. 7, when of course the shaft H is free to revolve independently of the crank-handle K, and when this is held in this position the shaft H may of course revolve and follow the motion of the drum D, while the crank-handle hangs idle.

It is desirable, as before stated, that a means be provided by which the rope may be gradually slacked off as the drilling operation proceeds and the drill-rod descends under the force of the weight W. It is also desirable that the descent should be controlled and the apparatus held at any point desired. To this end I have provided a small shaft I, having suitable means of manipulation, such as a hand-wheel I', and which bears upon its ends below and adapted to enter into engagement with the spur-wheel H a corresponding spur-wheel H'. The cogs or projections on these wheels H' and I' are of a peculiar form. While they can be turned so as to pass each other and thus permit the revolution of their respective shafts without complete disengagement, they still do not intermesh, as regular spur gear-wheels do, so that one will drive the other, but are so arranged, as shown in Fig. 8, that a tooth of the wheel I' will act as a brace-stop against a tooth of the wheel H', thus serving as a detent therefor, unless they are purposely moved so as to pass. The utility of this is that by manipulating the shaft I by means of its hand-wheel I' the rope can be slacked off a distance corresponding to each cog of the wheel I' and then stopped and there held without the trouble of throwing into or out of engagement any other detent. In other words, these spur-wheels act as an automatic detent, which is capable, by a slight turning of the shaft I, to proceed in a step-

by-step manner. When it is desired to wind up the rope, the shaft I can be slid endwise until the wheels do not engage.

Having thus fully described my said invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the walking-beam of a well-drilling machine, of a revolving loosely-mounted frame carried by wheels or cranks and provided with sheaves between which the ends of said walking-beam pass, substantially as shown and described.

2. The combination, in a well-drilling machine, of the walking-beam by which the rope is given its reciprocating movement, and a means for driving said walking-beam consisting of a loosely-mounted frame carried by wheels or cranks and provided with sheaves or rollers which form the contact devices for said walking-beam.

3. The combination, in a well-drilling machine, of the weight-carrying rope, a walking-beam for operating said rope, and mechanism for operating said walking-beam consisting essentially of a loosely-mounted frame carried by wheels or cranks and provided with contact-surfaces bearing upon said walking-beam.

4. The combination, in a well-drilling machine, of the weight-carrying rope, a walking-beam for operating the same, and mechanism for driving said walking-beam consisting of a shaft, a pair of gear-wheels thereon, a loosely-mounted frame hung between said gear-wheels eccentric to the axis of the shaft, rollers carried in said frame which come in immediate contact with the walking-beam, and a second shaft having a corresponding pair of gear-wheels which mesh with the gears carrying the loosely-mounted frame, substantially as shown and described.

5. The combination, in a well-drilling machine, of the walking-beam by which the drill-rod is operated, and a revolving loosely-mounted frame carried by wheels or cranks, and provided with sheaves between which one end of said walking-beam passes, the ends of one or both the shafts of said sheaves being carried by adjustable bearings in said frame, with set-screws for adjusting said frame, substantially as set forth.

6. In a well-drilling machine, the combination, of the walking-beam by which the drill-rope is given its reciprocating movement, means for driving said beam consisting of a loosely-mounted frame with suitable bearings therefor and carried by wheels or cranks, and a weight mounted on the same end of said walking-beam to which said drill-rope is connected, substantially as set forth.

7. The combination, in a well-drilling machine, of the weight-carrying rope, the mechanism for operating said rope, the rope-winding drum, a windlass-shaft for winding said drum bearing a spur-wheel, and a second shaft bearing a corresponding spur-wheel engaging therewith, said spur-wheels being formed as shown and described to operate as a continuous but shifting detent, substantially as shown and described.

In witness whereof I have hereunto set my hand and seal, at Indianapolis, Indiana, this 7th day of March, A. D. 1896.

LORENZO D. ENNES. [L. S.]

Witnesses:
H. D. NEALY,
JAMES A. WALSH.