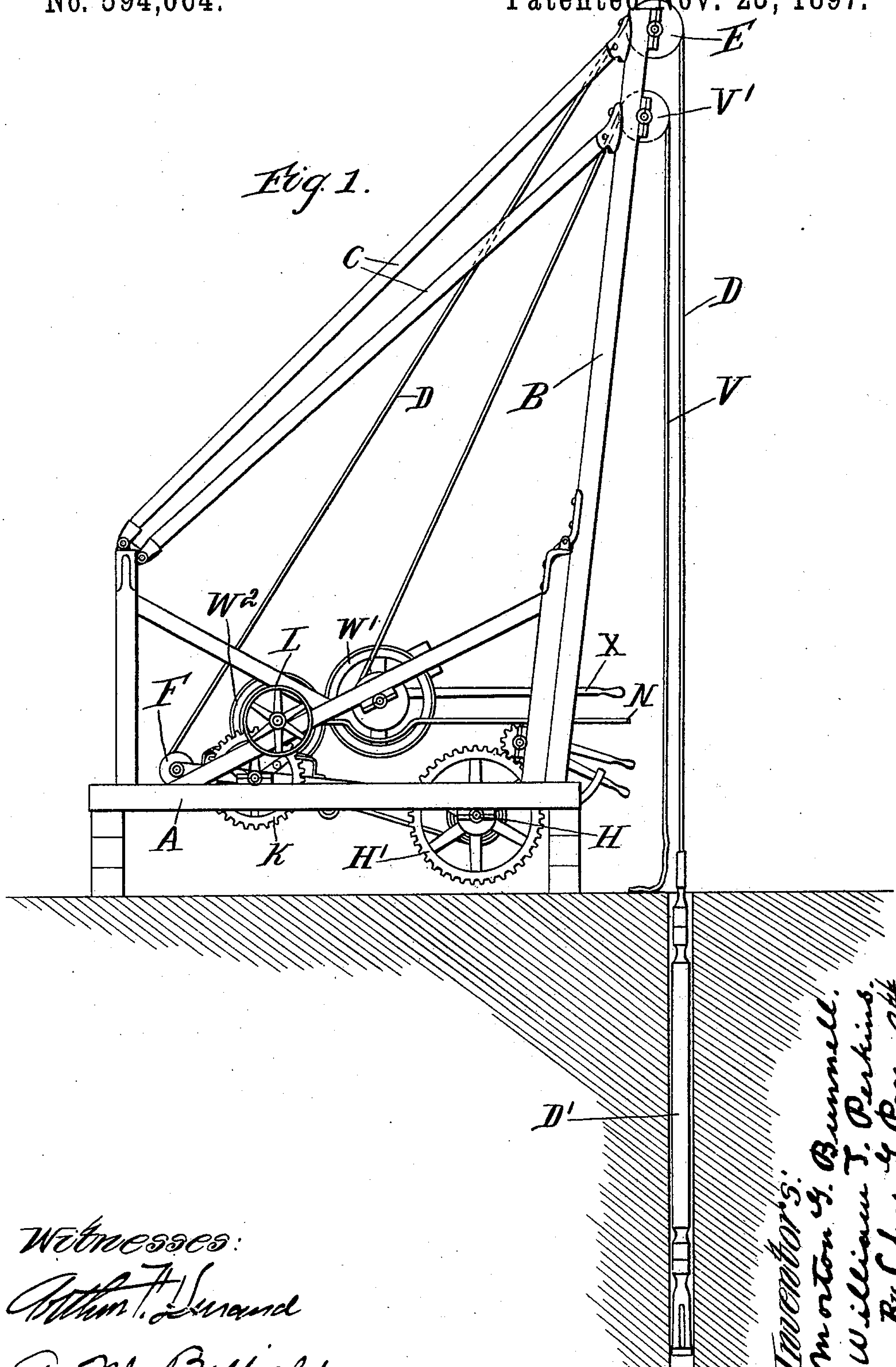
(No Model.) 5 Sheets—Sheet 1.

M. G. BUNNELL & W. T. PERKINS.

WELL DRILLING MACHINE.

No. 594,064. Patented Nov. 23, 1897.



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(No Model.) 5 Sheets—Sheet 2.

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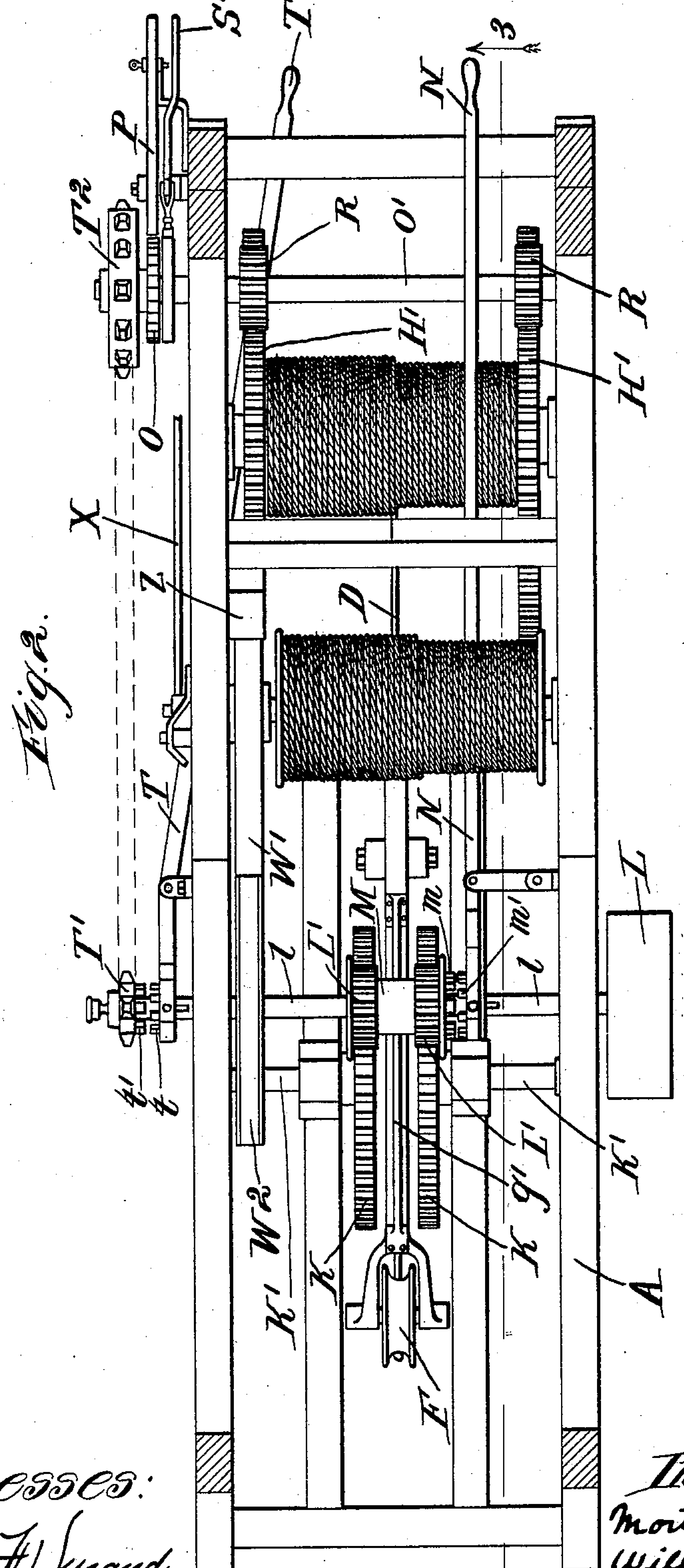

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(No Model.) 5 Sheets—Sheet 3.

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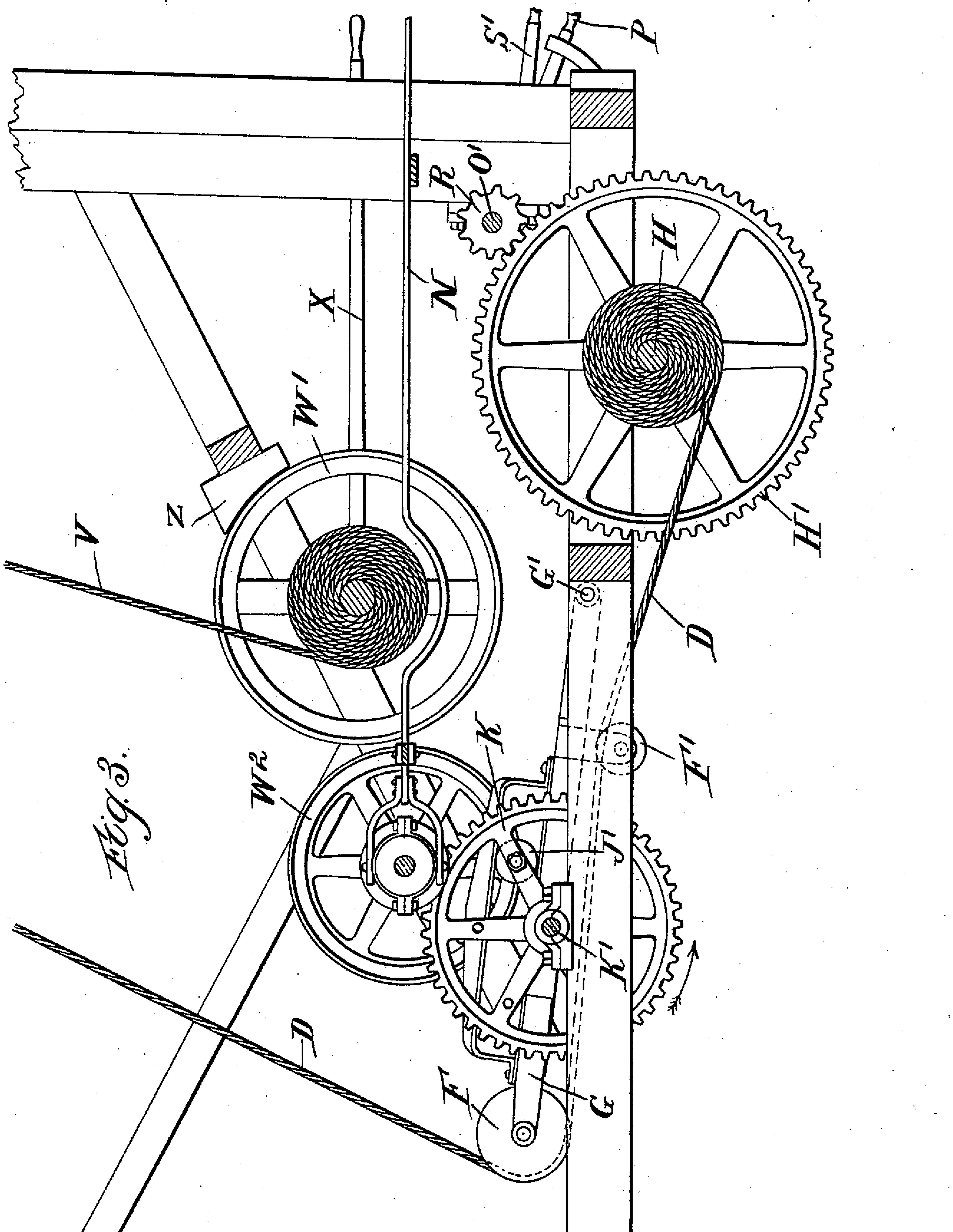

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(No Model.)

5 Sheets—Sheet 4.

M. G. BUNNELL & W. T. PERKINS.

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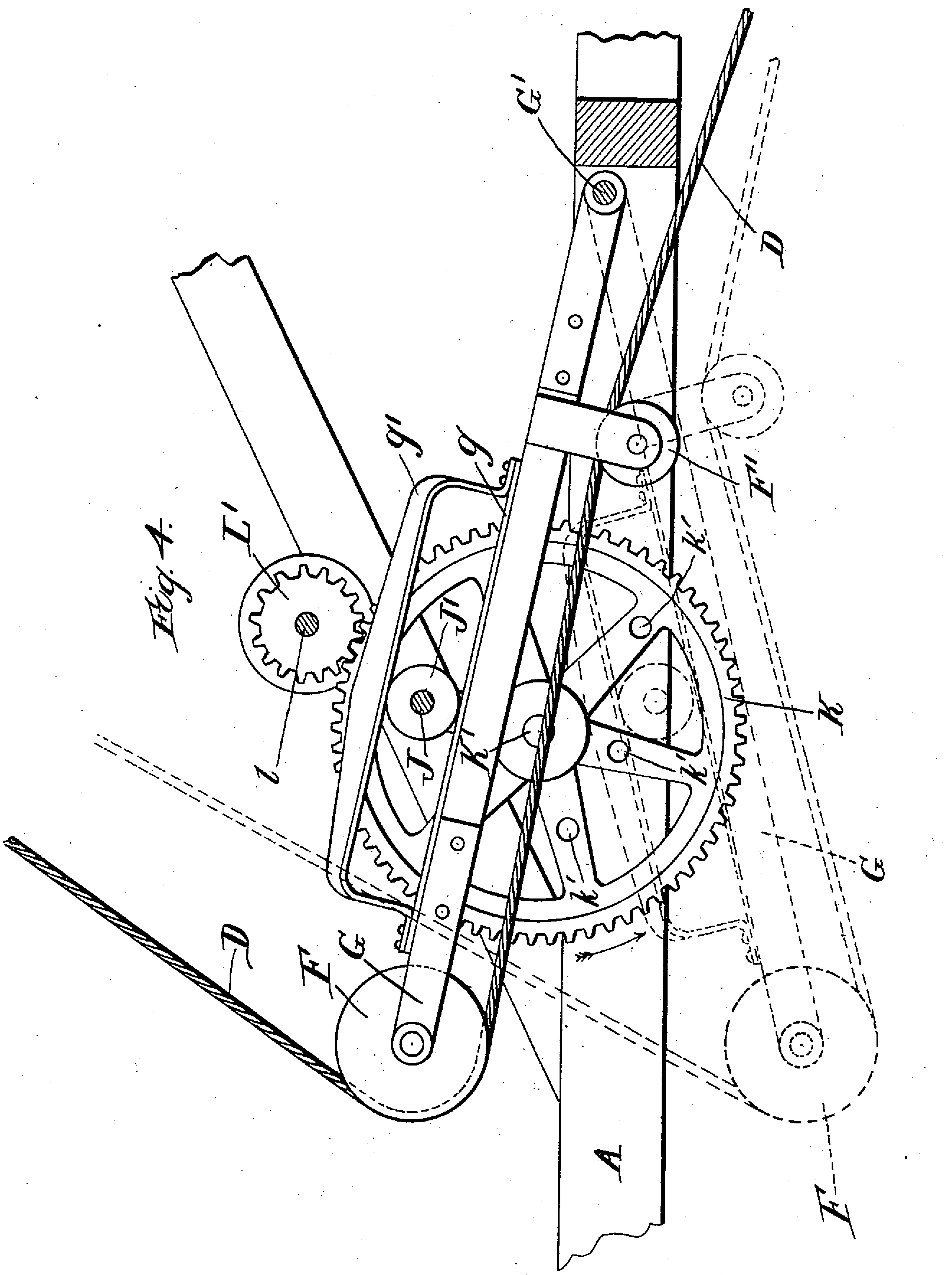

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(No Model.) 5 Sheets—Sheet 5.

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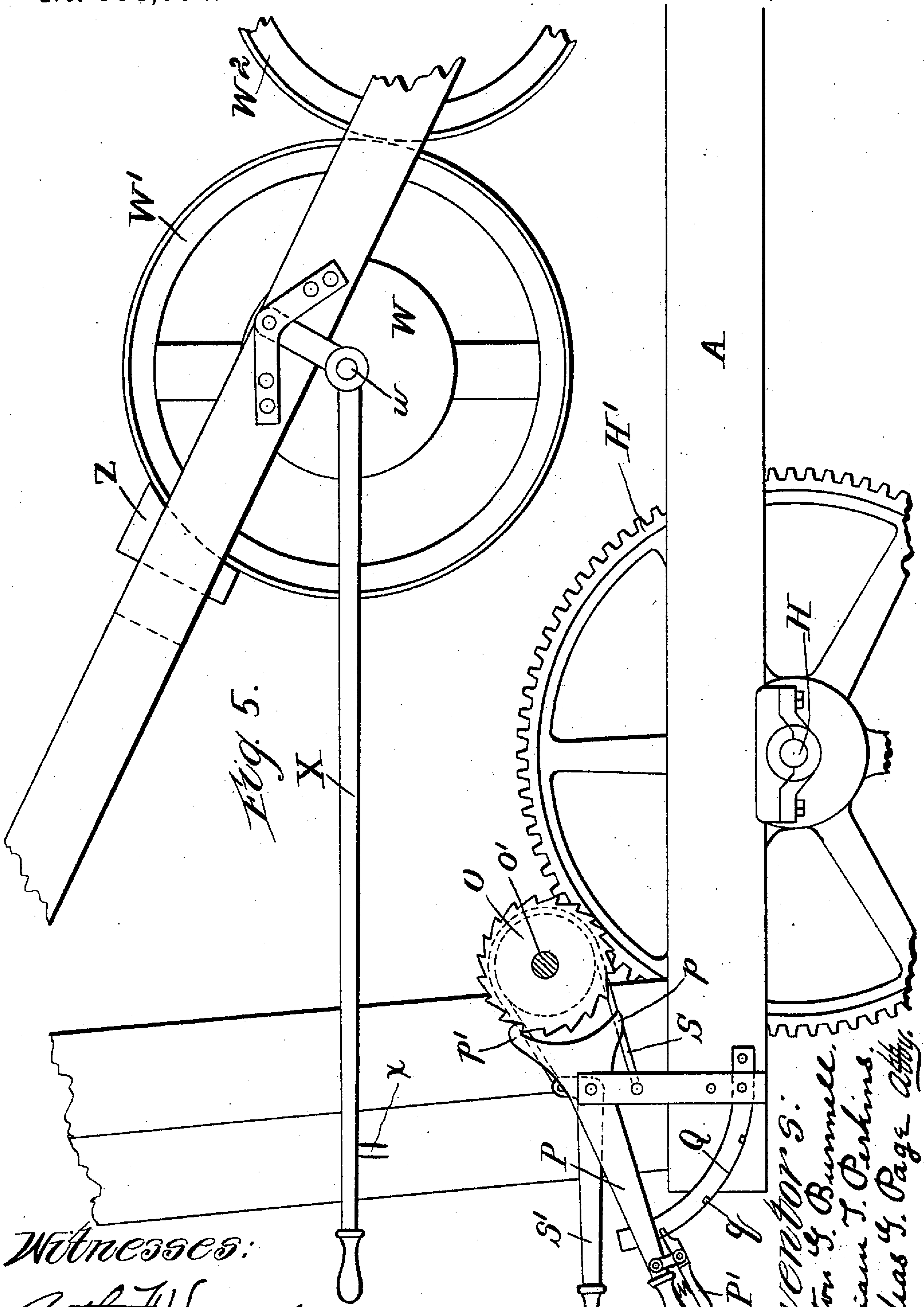

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UNITED STATES PATENT OFFICE.

MORTON G. BUNNELL, OF CHICAGO, ILLINOIS, AND WILLIAM T. PERKINS, OF RENSSELAER, INDIANA, ASSIGNORS TO FREDERICK C. AUSTIN, OF CHICAGO, ILLINOIS.

WELL-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 594,064, dated November 23, 1897.

Application filed December 14, 1895. Serial No. 572,135. (No model.)

To all whom it may concern:

Be it known that we, MORTON G. BUNNELL, residing at Chicago, county of Cook, and State of Illinois, and WILLIAM T. PERKINS, residing at Rensselaer, county of Jasper, and State of Indiana, citizens of the United States, have invented certain new and useful Improvements in Well-Drilling Machines, of which the following is a specification.

Our invention relates to well-machines in which a rope or cable is led upwardly from a drum to a pulley at the upper portion of a derrick and thence downwardly to the well-shaft, so as to connect with and suspend the drill, which can be raised and lowered by relatively reverse operations of the drum.

Prominent objects of the invention are to avoid the jar and strain common to machines of this kind while in operation, to permit the distance through which the drill falls to be adjusted to meet the requirements of various soils, and to allow either the drill or sand-pump to be raised or lowered in the well at will.

In carrying out our invention the drill-rope in passing from the main drum to the derrick-pulley is led about a pulley carried by a vibratory shaft or walking-beam, and inasmuch as the drum may be locked or prevented from rotating, the end of the rope is, in effect, tied there, while at the same time movement of the walking-beam will cause the elevation and depression of the drill at the free end of the rope. For instance, the descent of the beam lifts the drill, and its ascent allows the latter to drop. Vibration of this walking-beam is caused by the rotation of a crank, which we preferably so arrange that the initial downward movement of the beam is given by that part of the crank's rotation next succeeding its travel in a direction parallel to the length of the beam. The descent of the latter then will start very gradually, and consequently the initial rise of the tool will be very slow and unattended by jerking of the rope. The crank is also arranged so that during the greater portion of its rotation the beam descends, and during the remaining portion of such rotation the latter ascends. This permits the drop of the drill to be more rapid than its rise, and consequently to strike a harder blow at the bottom of the well. In order to pay out additional rope as the well deepens, we provide an escapement which, although normally locking the drum, permits any desired length of rope to be unwound. Independent gearing is also provided by which the drum may be rapidly rotated, so as to lift the tool out of the well. In addition we provide our machine with a second drum, upon which a rope for the sand-pump may be wound, and a second pulley in the derrick, over which it may be led. This sand-rope drum may be rotated by friction mechanism to which power is applied from the main driving-shaft.

In the accompanying drawings, Figure 1 shows an elevation of our improved machine. Fig. 2 is a plan of the same having the upper portion of the derrick removed for convenience of illustration. Fig. 3 is a section at line 3 3 of Fig. 2. Fig. 4 is an elevation showing more clearly the walking-beam and its operating mechanism. Fig. 5 shows the escapement for controlling the main drum and the friction mechanism for operating the sand-rope drum.

In our machine the frame A and derrick B may be of any approved construction, the latter being desirably strengthened by the braces C. The rope D, terminating in the drill D′, after passing over the pulley E on the derrick, is led around the pulley F at the end of the walking-beam G and thence to the drum H. The beam G is mounted to vibrate or swing about the shaft G′ as a center, and the crank J, desirably provided with the sleeve or roller J′, is so arranged as to elevate or depress said beam by its rotation, traversing at the same time backward and forward along a portion of the length of the beam. Operated thus by the rotation of a crank the movement of the beam is not uniform—that is, the motion at the extremities of its vibration or stroke when the crank is traveling in a direction nearly tangential to the length of the beam is much slower than the motion of the intervening portion of the stroke. Consequently the tools are not suddenly started and do not jerk the rope, and as the centers of the shafts G′ and K′ are not on the same horizontal line the time taken for the rise of the beam is not the same as that taken for its fall.

For instance, it is obvious that at the position shown by the full lines in Fig. 4 the walking-beam G will be at the top of its stroke, and consequently the drill D′ will be in its lowest position; also, when in the position indicated by the dotted lines—the lowest position of the beam—the drill will be in its most elevated position preparatory to dropping. It is also evident that owing to the position of the pivotal shaft G′ with regard to the circular path which the crank J describes the distance traveled by the latter while the beam descends from the highest to the lowest position is greater than that passed over during the complete ascent of the latter. Consequently, assuming the rotation of the crank J to be uniform, the beam will rise more rapidly than it descends, and as a result the drill will fall with greater speed and strike a harder blow than would be the case with a less rapid descent.

In a machine of this kind it is desirable to be able to vary the distance through which the tool drops before striking. This may be accomplished by making the crank adjustable with reference to the walking-beam, so that the beam may be given a different length of vibratory stroke at different times. Any of the well-known ways of changing the throw of the crank may be utilized for this purpose. As a preferred construction a couple of wheels K are mounted in parallel planes on separate concentric shafts K′, affording space between them for the beam G and its operating crank-pin J. This pin J is held by said wheels by being passed through a similarly-located hole or bearing in each wheel and retained against longitudinal movement in such position. Said wheels K are provided with a number of such registering holes or bearings k' at various distances from the common center, in any pair of which the pin J may be secured. Hence when it is desired to change the length of drop of the drill to meet the requirements of different varieties of soil the pin J is withdrawn from the set of bearings in the wheels K which it then occupies and is placed in another set nearer to or farther from the center, whereby it is given a less or greater throw and the tool a corresponding change in drop, according to need.

It is also of advantage to hold the crank-pin and beam in close contact, so as to avoid bumping, and to so arrange the beam that it will be lifted on its upstroke, thereby allowing the drill to fall with its full weight. As a preferred means of securing these ends a yoke or keeper g' is fastened to the beam G, forming with it a guideway within which the roller J′ may travel. This arrangement evidently holds the beam and crank movably together and compels the crank to lift as well as depress the beam by its rotation. In practice we desirably provide the beam with a track g, which affords a durable pathway for the travel of the roller J′.

An additional sheave or pulley F′ is desirably secured to the under side of the walking-beam G, which by engaging the drill-rope prevents chafing of the latter and insures a greater lift for the drill.

The wheels K are driven from the main driving-shaft l, carrying the pulley L, by the intervening gear-wheels L′, Fig. 2. The latter, however, we prefer to mount upon the sleeve M, which is loose on the shaft l, and to arrange upon this sleeve M the clutch m, which may be engaged with its counterpart m', rotating with the shaft l, by swinging the lever N. Obviously, then, the drill D′ will be successively lifted and allowed to drop, giving a series of blows, which may be discontinued by throwing out the clutch m by the lever N, it being understood that the rope is held fast at one end by locking the drum H. When, however, increased depth of the well renders the action of the drill ineffective, the operative length of rope may be made adequate by unwinding a portion from the drum H by means of an escape-wheel O, whose rotation is controlled by the hand-lever P, Figs. 2 and 5. This wheel O is mounted on the shaft O′, upon which also are the pinions R, meshing with gears H′. Evidently the weight of the drill D′ will tend to unwind the rope D, and this may be permitted by releasing the escape-wheel O′ by the lever P. If but a slight length of the drill-rope is desirably allowed to unwind, the prongs p and p' may be alternately caused to engage with teeth on the wheel O; but if a considerable length is required the lever may be so held that neither prong will engage with the teeth, thereby permitting free rotation of the drum. When a sufficient length has been unwound, the catch P′ may be caused to engage with slots q in the arc Q, which evidently locks the drum by holding the wheel O. Too rapid rotation of the drum H is prevented by a suitable brake—as, for instance, the strap S, which may be tightened around the periphery of a suitable wheel by the lever S′, Fig. 5.

When it is desired to rapidly raise the drill by reeling the drill-rope on its drum, the clutch portion t, Fig. 2, rotating with the driving-shaft l, is thrown into engagement with the portion t', loose upon the same shaft, by the lever T. This causes the rotation of the sprocket-wheel T′, which in turn drives the sprocket-wheel T^2, mounted on the shaft O′, (the transmitting chain or belt being indicated by the dotted lines,) and consequently the drum H. The vibration of the walking-beam G may be discontinued, as hereinbefore stated, before reeling the drill-rope.

The sand-rope V is passed over the pulley V′ and thence to the drum W, upon whose shaft is the wheel W′. In close proximity to the latter is a similar wheel W^2, mounted on the driving-shaft l, which, it is understood, is continuously rotating. Evidently if the peripheries of these wheels are brought in contact the drum W will be rotated and the sand-rope V reeled thereupon. This we accomplish by journaling the end of the drum-shaft which carries the wheel W′ in a swinging lever X, as at *w*, Fig. 5, whose depression forces the wheels together, with the result above noted.

A stop *x* is desirably provided to hold the wheels normally apart, and a block Z is arranged in such a way that an upward lift of the lever X will press the wheel W′ against the former and serve to brake it.

The handles of the various levers are desirably brought together at the rear of the machine, so as to allow its complete operation from one location, and for convenience of transportation the frame may be mounted on suitable wheels.

It will be noticed that the construction of this machine allows the operator to run it in a reverse direction, if desired, by applying power to the pulley L in an opposite direction, whereby the tools may be given a quick rise and slow fall. This is a very desirable characteristic when for any reason the tools are inclined to stick in the well-shaft.

What we claim as our invention is—

1. In a well-drilling machine, the combination of the main drum; a pivotally-secured walking-beam provided with a pulley at its free end, and a yoke forming a guideway; concentrically-mounted gear-wheels carrying a crank-pin working in said guideway; a shaft adapted for continuous rotation from a suitable driving power; pinions mounted on said shaft, but not rigid therewith, and meshing with said gear-wheels; and a clutch to compel the rotation of said pinions by said shaft; substantially as described.

2. In a well-drilling machine, the combination of the main drum; a pivotally-secured walking-beam having a pulley at its free end, and a sheave located between said pulley and its pivoted end, and provided with a yoke adapted to serve as a guide; concentrically-mounted gear-wheels carrying a crank-pin provided with a roller working in said guideway, said wheels having corresponding bearings for said pin at varying distances from their common center; a shaft adapted for continuous rotation from suitable driving power; pinions mounted on a sleeve loose upon said shaft, and meshing with said gear-wheels; and a clutch to compel the rotation of said pinions by said shaft; substantially as described.

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