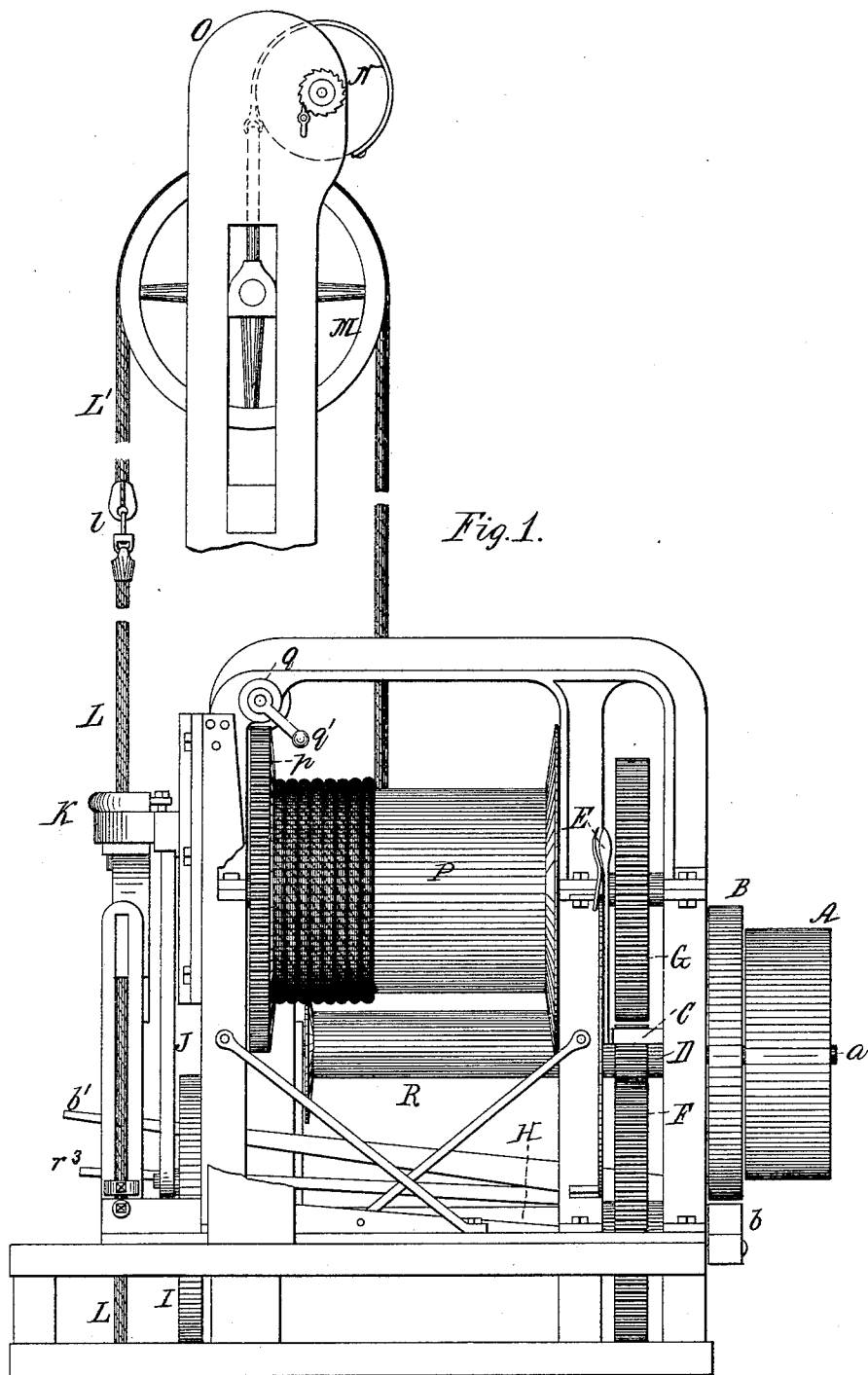


W. C. WELLS.
WELL DRILLING MACHINE.

No. 399,459.

Patented Mar. 12, 1889.



Witnesses:
W. C. Jirdinston.
A. O. Loveland.

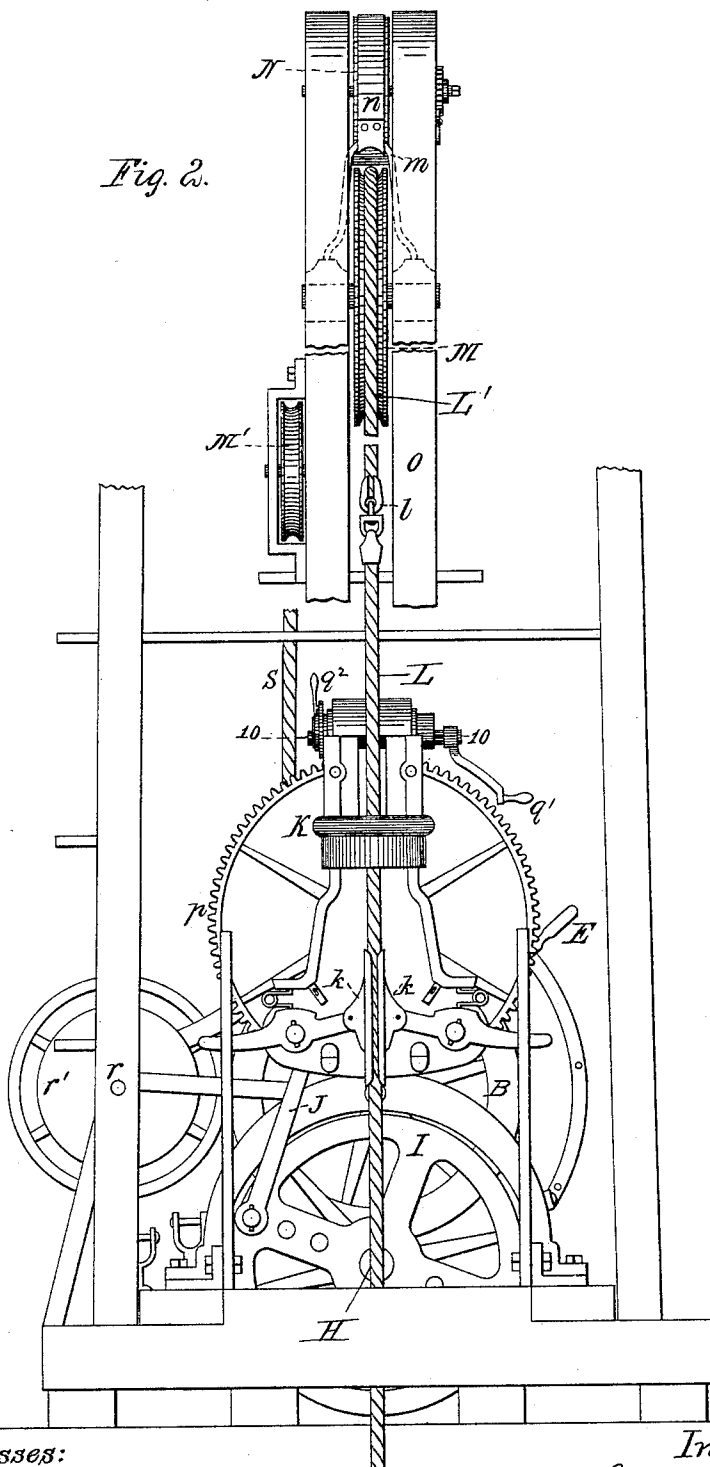
Inventor:
Willet C. Wells
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Fig. 2.



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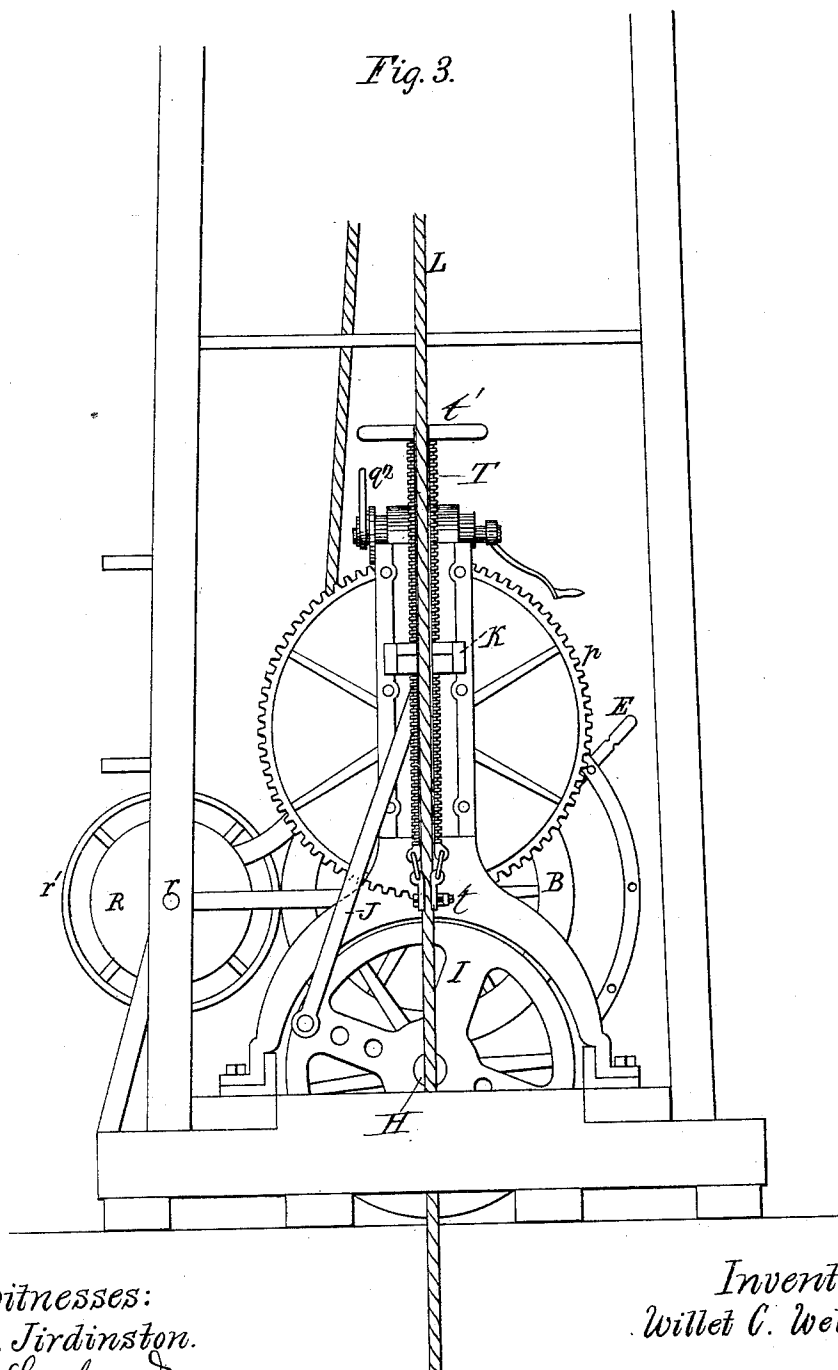
(No Model.)

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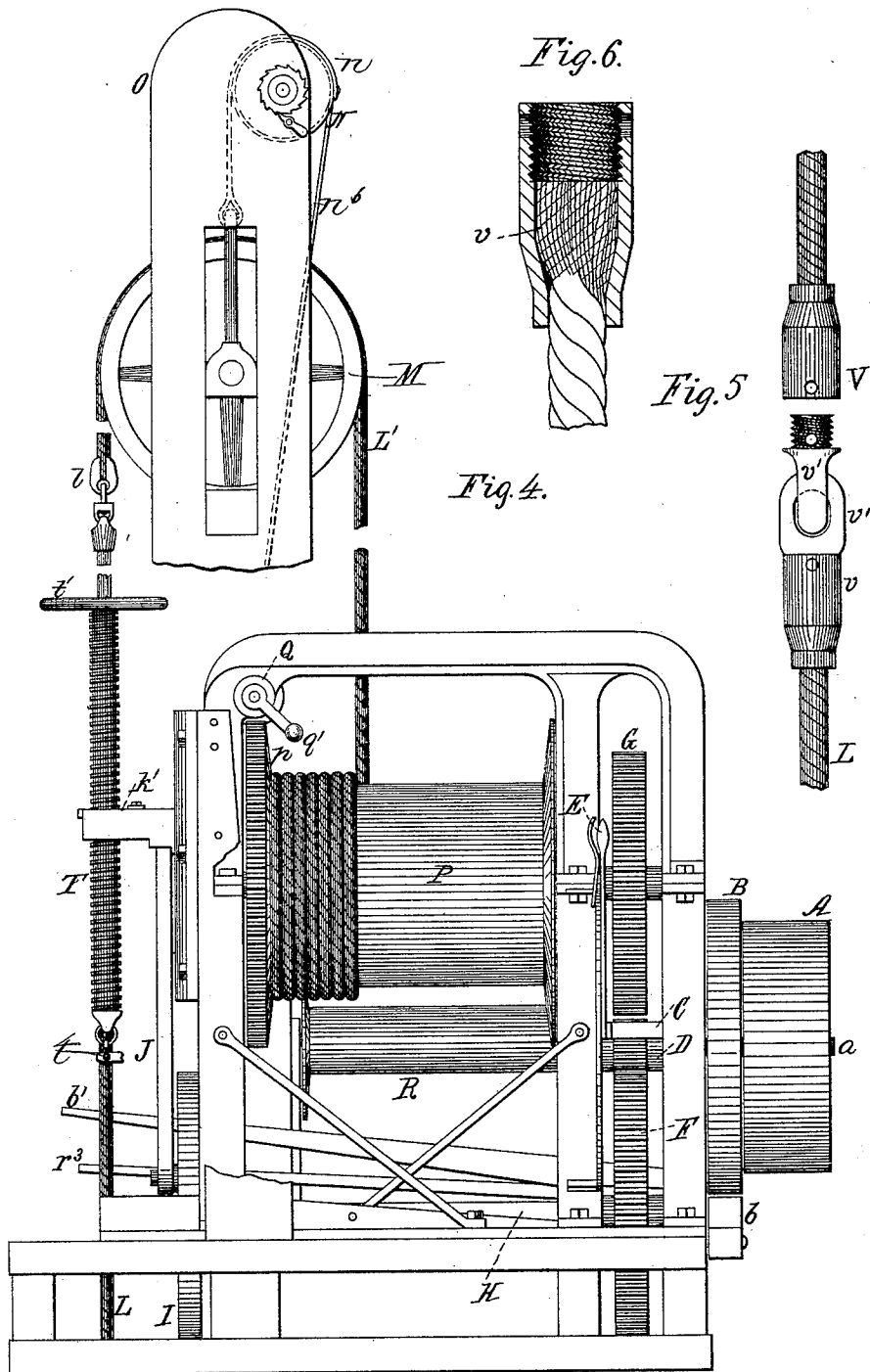
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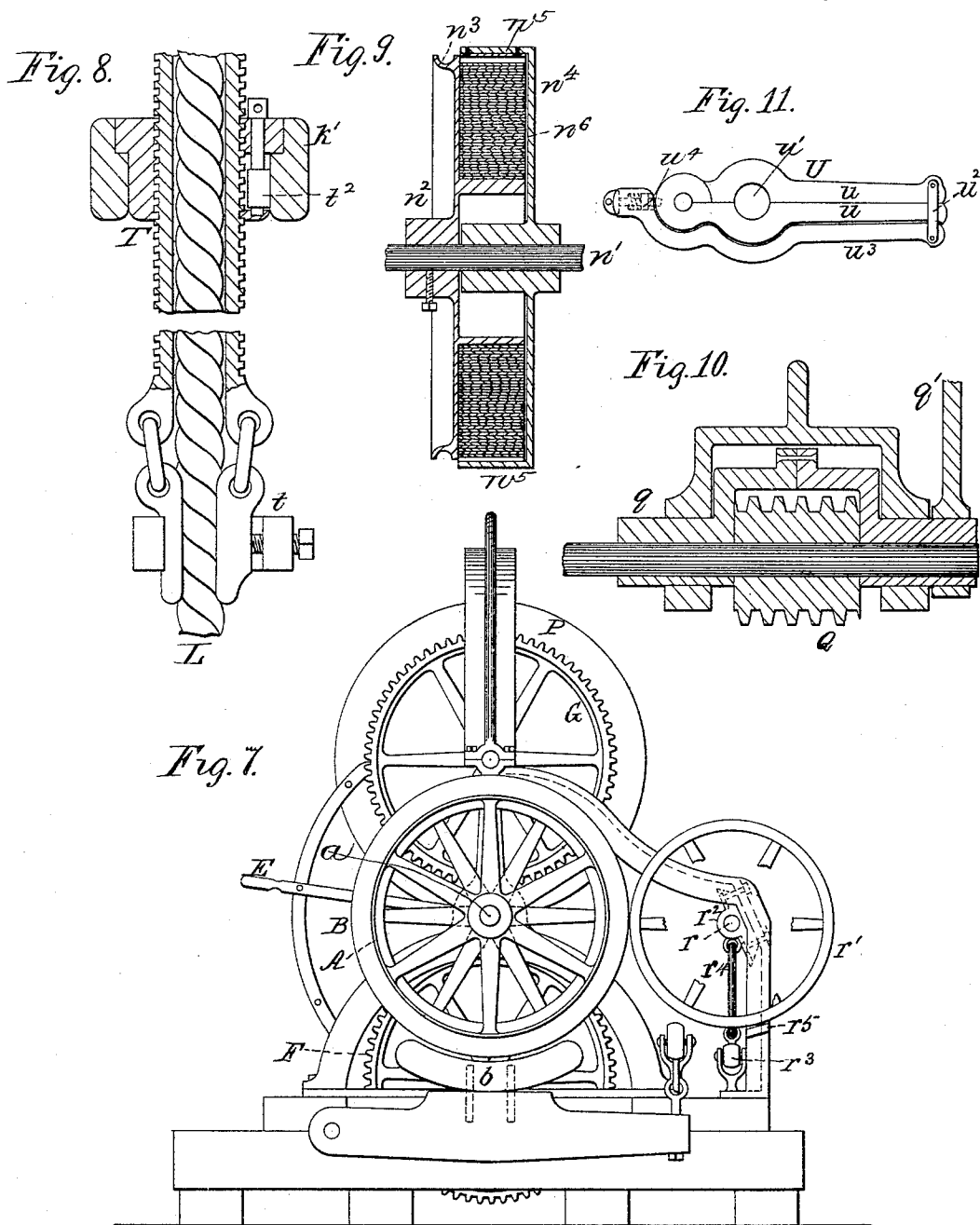
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UNITED STATES PATENT OFFICE.

WILLET C. WELLS, OF TIFFIN, OHIO.

WELL-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 399,459, dated March 12, 1889.

Application filed July 22, 1887. Serial No. 244,968. (No model.)

To all whom it may concern:

Be it known that I, WILLET C. WELLS, a citizen of the United States, residing at Tiffin, in the county of Seneca and State of Ohio, have invented a new and useful Improvement in Well-Drilling Machines, of which the following is a specification.

My invention relates to that class of machinery used in drilling or boring wells; and it consists in a novel machine and in the various details of construction hereinafter pointed out.

In the drawings, Figure 1 is a side elevation of one of my improved well-drilling machines. Figs. 2 and 7 are elevations of the respective ends of the same. Fig. 3 is an end elevation showing the machine provided with a temper-screw; Fig. 4, a side elevation of the same. Fig. 5 is a front view of a cable coupling. Fig. 6 is a vertical section of a chamber adapted to hold the end of the cable. Fig. 8 is a vertical section of the temper-screw. Fig. 9 is a vertical section of a spring-pulley for taking up slack in the cable. Fig. 10 is a section upon the line 10 10, Fig. 2. Fig. 11 shows a grip for turning the tools.

A is a belt-wheel; B, a balance-wheel; C, a pinion mounted upon the shaft *a*; D, an eccentric upon the same shaft and supported in suitable bearings; E, a lever adapted to actuate the eccentric, and F and G spur-wheels. By means of the eccentric D and a lever, E, the shaft *a* may be raised or lowered, so as to cause pinion C to engage spur-wheel F or G, as may be desired. The spur-wheel F is mounted upon a shaft, H, carrying a crank-wheel, I, which is connected by a pitman, J, to a cross-head, K. The cross-head is provided with suitable jaws, *k k*, Fig. 2, adapted to engage with the drill-stock or with a cable, L, which supports the drill.

The cable L is connected by a swivel, *l*, to a rope, *L'*, which passes over a sheave, M, preferably suspended from a spring-pulley, N, in the top of the derrick O, and is coiled upon a drum, P, which is mounted upon the shaft which carries the spur-wheel G. When the pinion C is in engagement with the spur-wheel F, power is transmitted through shaft H, crank-wheel I, and pitman J to the cross-head K. As the cross-head is forced upward by the pitman, jaws *k k* engage with the rope attached to the cable and lift it and the drill with which it is connected. As the pitman reaches

the limit of its upward motion, the jaws are automatically released and the drill drops.

I prefer to use reciprocating jaws substantially like those described and claimed in Letters Patent No. 296,804, granted me April 15, 1884, for a rock-drilling and well-boring machine, and reissued June 1, 1886, as Reissue No. 10,731.

When it is desired to hoist the tools out of the well, the pinion C is thrown into engagement with the spur-wheel G, and power transmitted to the drum P, upon which the rope is coiled. This drum is rotated for the purpose of paying out the rope for the sinking-tools by means of a worm, Q, actuated by a crank, *q'*, and engaging with a worm-wheel, *p*, secured to the drum P or its shaft.

The worm Q may be thrown in or out of engagement with the worm-wheel by means of an eccentric, *q''*, and lever *q'*. A brake, *b*, adapted to engage with the balance-wheel B and actuated by a lever, *b'*, (preferably a foot-lever,) serves to stop or control the machine when the tools are being lowered into the well.

R is a drum mounted upon a shaft, *r*, and provided at the end adjacent to the balance-wheel with a friction-wheel, *r'*. The end of shaft *r*, carrying the friction-wheel, is journaled in a box, *r''*, sliding in an incline, and the box may be raised or lowered in said incline by means of a foot-lever, *r'''*, connected therewith by a link, *r''''*. A rope, S, carrying the sand-bucket, passes over a sheave, M', mounted upon the derrick-head O, and coils around the drum R. When the sand-bucket is to be raised, the lever E is placed in such a position as to hold the pinion C out of engagement with the spur-wheels F and G, and the friction-wheel *r'* is brought into contact with the balance-wheel B by actuating the lever *r'''*.

For the purpose of controlling the spool when lowering the sand-bucket, a brake, *r''''*, with which the friction-wheel may be brought into contact by means of the lever *r'''*, is provided.

The sheave M is suspended from the spring-pulley N by means of a yoke, *m*, which carries the boxes for the shaft upon which the sheave is mounted, and a strap, *n*, which connects the yoke and the pulley. To the shaft *n'* of the spring-pulley is secured a disk, *n''*, having a grooved periphery and an inwardly-projecting flange, *n'''*, which constitutes a

drum surrounding the shaft. Another disk, n^4 , having a peripheral flange, n^5 , is journaled to the shaft, and a coiled spring, n^6 , is secured at one end to the flange n^3 of the fixed disk and at the other end to the flange n^5 of the revolving disk. The tension of the spring may be regulated by a rope, n^6 , taking over the grooved periphery of the disk n^2 , extending within reach of the operator and held by a ratchet and pawl. The spring-pulley, by means of the strap n taking over its periphery, lifts the sheave M at each upward movement of the cross-head, thereby taking up the slack in the cable. The lower ends of the ways in which the sliding boxes m travel are provided with elastic bumpers o .

For drilling in soft material—such as drift deposit or soft shale—where it is necessary to drill slowly and to thoroughly mix the material, so that it may be pumped out, I employ in place of the jaws $k k$ an externally-threaded temper-screw, T , Figs. 3 and 4, through which the cable passes and to which it is firmly gripped by a clamp, t . The temper-screw is provided with a hand-wheel, t' , by which it may be rotated, and is supported by a nut, k' , journaled in the cross-head. By means of an eccentric, t^2 , this nut may be locked to the screw, leaving the nut free to turn in the cross-head without lowering the screw relatively thereto, or it may be locked to the cross-head, leaving the screw free to turn in the nut. The temper-screw, the nut supporting it, the cross-head, and the hand-wheel are preferably recessed longitudinally in order to permit the cable to be readily placed in position or removed.

For turning the rope to give a rotary motion to the drill-tools, I employ the grip U , Fig. 11, in which the jaws u are pivotally connected at one end, and are provided with recesses u' , adapted to take around the rope. The outer of these jaws is connected at the other end by a link, u^2 , to an arm, u^3 , which is provided at its free end with a spring-catch, u^4 , or other device adapted to lock it to the pivoted end of the jaws. When the arm is released from engagement with the pivoted end of the jaws, the latter are free to open. When the rope is inclosed, the jaws are swung toward each other and the arm is brought into contact with the free end of the inner jaw, thus affording a double leverage in closing the jaws.

For connecting the lengths of the cable, I employ the coupling V , Fig. 5, in which v represents a metallic chamber, the interior of which converges at one end and is provided at the other end with a screw-thread. The end of a cable is passed through the converging end of the chamber and the ends of the strands of the cable are separated. Soft metal is then poured in and allowed to set, thus locking the cable in the chamber. The threaded end of the chamber is adapted to engage with a corresponding thread upon one end of a coupling-link, $v' v'$, preferably jointed

and adapted to engage at the other end with another chamber, v .

To operate the machine, power is applied to the belt-wheel and motion transmitted to the cross-head. At the outset the jaws grip the drill-stock and lift and drop it until the tools are buried. When this is done, the cable L (preferably of larger size than the main cable) is coupled to the drill-stock, passed through the jaws, and connected at its upper end to the rope L' by means of the swivel l . The cable is then lifted and dropped by means of the pitman and jaws, thereby raising and lowering the drill. The cable L is at first attached to the rope L' in such a way that the swivel is just below the sheave M at the top of the derrick, so as to permit the continual turning of the cable in one direction, thus insuring a round and true hole and avoiding danger of unscrewing the drill. This arrangement permits a free and direct drop of the drill-tools, which cannot be obtained by the walking-beam. When the tools have been lowered until the swivel approaches the jaws, the cable is uncoupled from the drill-stock and another piece is coupled to the drill-stock and the cable L , which is returned to its original position. When the drill-tools have been lowered to a depth equal to the length of the piece of cable last inserted plus substantially the length of the cable L , a longer piece is inserted and the work continued. The cable may be of wire or other material.

I claim—

1. In a well-drilling machine, the combination of a driving-shaft, a pinion secured thereto, a spur-wheel transmitting power to a cross-head, thereby imparting motion to the drill, and a spur-wheel adapted to actuate the rope-spool for the purpose of raising or lowering the drill, with mechanism for throwing the pinion into engagement with either spur-wheel, substantially as specified.

2. In a well-drilling machine, the combination of a driving-shaft, a pinion mounted thereon, a spur-wheel, a crank-wheel connected therewith and adapted to be driven thereby, a pitman connecting the crank-wheel with a cross-head provided with mechanism adapted to engage with the drill-stock or a cable connected therewith, a rope-spool and a spur-wheel connected therewith, with an eccentric adapted to throw the pinion into engagement with either spur-wheel, substantially as specified.

3. In a well-drilling machine, the combination of a driving-shaft, a balance-wheel thereon, a drum carrying the sand-bucket rope, and a friction-wheel connected with the drum with a sliding box carrying the drum-shaft, and a lever connected with and adapted to actuate the sliding box for the purpose of bringing the friction-wheel into engagement with the balance-wheel, substantially as and for the purpose specified.

4. In a well-drilling machine, the combination of the driving-shaft a , balance-wheel B ,

brake r^5 , drum R, carrying the sand-bucket rope, and friction-wheel r' , with a sliding box, r^2 , and a lever, r^3 , connected with and adapted to actuate the sliding box for the purpose of

bringing the friction-wheel into engagement with the balance-wheel, substantially as and for the purpose specified.

5. In a well-drilling machine, the combination of the driving-shaft a , pinion C, spur-wheel F, connected with and adapted to actuate the cross-head K, spur-wheel G, connected with and adapted to actuate the rope-spool, balance-wheel B, and friction-wheel r' , connected with the sand-bucket spool, with the eccentric D, substantially as and for the purpose specified.

6. In a well-drilling machine, the combination, with a reciprocating cross-head provided with mechanism adapted to engage with a cable carrying the drill-stock, of a rope supporting the cable carrying the drill-stock and connected to the cable by a swivel, and a clamp for rotating the cable, substantially as specified.

7. In a well-drilling machine, the combination, with a reciprocating cross-head provided with mechanism adapted to engage with a cable carrying the drill-stock, of a spring-pulley adapted to take up the slack in the cable, substantially as specified.

8. In a well-drilling machine, the combination, with a reciprocating cross-head provided with mechanism adapted to engage with a cable connected with the drill-stock, of a drum carrying a rope which supports the cable and mechanism for paying out the rope, substantially as specified.

9. In a well-drilling machine, the combination, with a reciprocating cross-head provided with mechanism adapted to engage with a cable connected with the drill-stock, of a drum carrying a rope which supports the cable, a swivel connecting the rope with the cable, and mechanism for rotating the cable, substantially as specified.

10. In a well-drilling machine, the combination of a reciprocating cross-head provided with mechanism adapted to engage with a cable carrying the drill-stock, and a drum carrying a rope which supports the cable, with mechanism for paying out the rope, and mechanism for actuating the drum for the purpose of raising or lowering the drill, substantially as specified.

11. In a well-drilling machine, the combination of a reciprocating cross-head adapted to engage with a cable carrying the drill-stock, with a rope supporting the cable, a drum to which the rope is connected, and a spring-pulley adapted to take up the slack in the cable, substantially as specified.

12. In a well-drilling machine, the combination of a reciprocating cross-head provided with mechanism adapted to engage with a cable carrying the drill-stock, with a spring-pulley, a yoke suspended from the spring-pulley and supporting a sheave, and a rope sup-

porting the cable and taking over said sheave, substantially as specified.

13. In a well-drilling machine, the combination of a reciprocating cross-head provided with mechanism adapted to engage with a cable carrying the drill-stock, with a spring-pulley, a yoke suspended from the spring-pulley and supporting a sheave, elastic bumpers beneath said yoke, and a rope supporting the cable and taking over said sheave, substantially as specified.

14. In a well-drilling machine, the combination of a reciprocating cross-head provided with mechanism adapted to engage with a cable connected with the drill-stock, a rope supporting the cable, a spring-pulley adapted to take up the slack in the cable, and a cord whereby the tension of said spring-pulley may be increased or decreased, substantially as specified.

15. The combination, in a well-drilling machine, of a reciprocating cross-head, an externally-threaded temper-screw, a clamp adapted to lock the temper-screw to a cable supporting the drill-stock, and a nut journaled in the cross-head and supporting the temper-screw, with mechanism for locking the nut to the temper-screw, substantially as specified.

16. The combination, in a well-drilling machine, of a reciprocating cross-head, an externally-threaded temper-screw, a clamp adapted to lock the temper-screw to a cable supporting the drill-stock, and a nut journaled in the cross-head and supporting the temper-screw, with mechanism for locking the nut to the cross-head, substantially as specified.

17. The combination, in a well-drilling machine, of a reciprocating cross-head, an externally-threaded temper-screw, and a clamp adapted to lock the drill-stock to a cable supporting the drill-stock, with mechanism for locking the nut to the temper-screw or to the cross-head, substantially as specified.

18. The combination, in a well-drilling machine, of a reciprocating cross-head, a temper-screw journaled therein, a clamp adapted to lock the temper-screw to a cable supporting the drill-stock, and mechanism for rotating the temper-screw, substantially as specified.

19. In a well-drilling machine, the temper-screw T, clamp t , nut k' , and means for rotating the temper-screw, in combination with the eccentric t^2 , substantially as and for the purpose specified.

20. The grip U, consisting of pivoted jaws u , having recesses u' , the arm u^3 , and the link u^2 , connecting the outer jaw with the arm, substantially as and for the purpose specified.

21. The grip U, consisting of pivoted jaws u , having recesses u' , the link u^2 , arm u^3 , and catch u^1 , substantially as and for the purpose specified.

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