

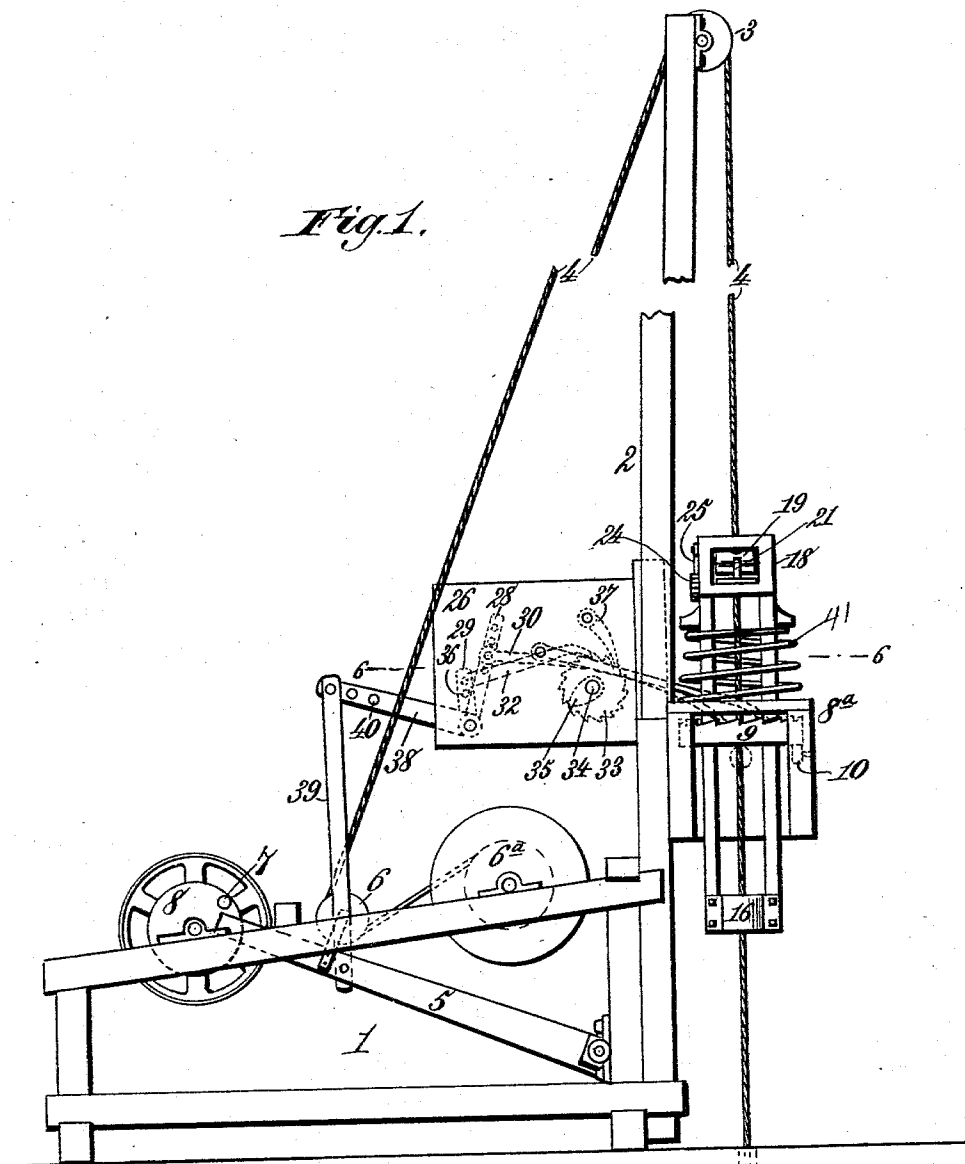
(No Model.)

2 Sheets—Sheet 1.

W. L. HARDCASTLE.
MECHANISM FOR BORING AND DRILLING WELLS.

No. 548,538.

Patented Oct. 22, 1895



Witnesses:

Robert G. Smith
Thos. A. Emme

Inventor:

William L. Hardcastle
By *James L. Norris*,
Atty.

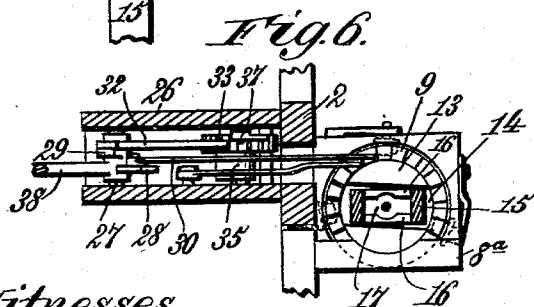
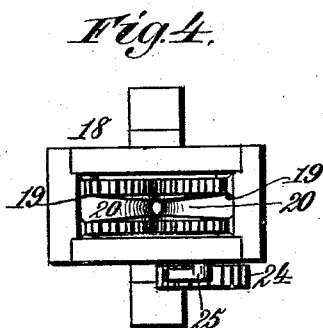
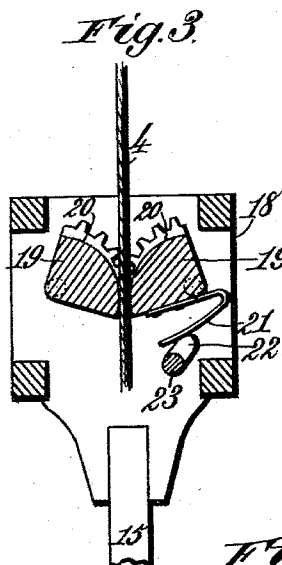
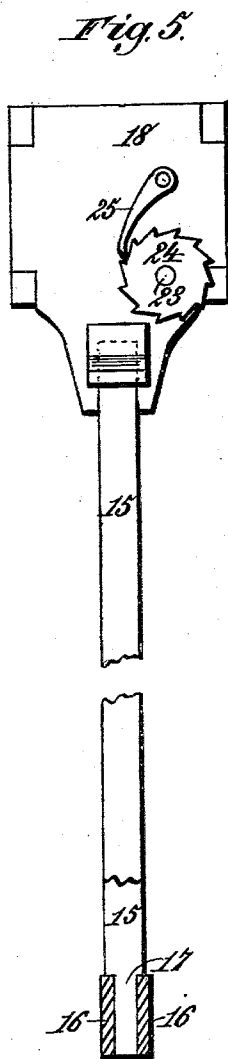
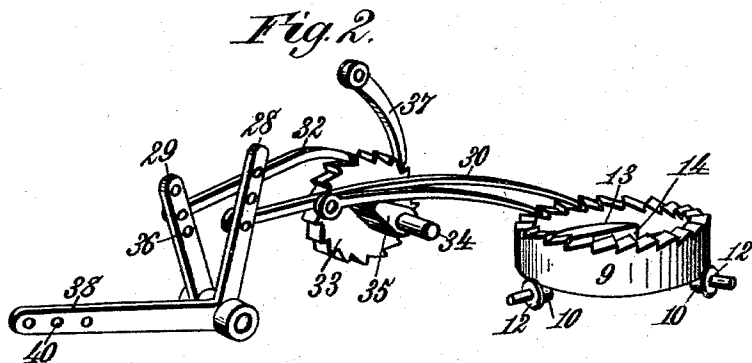
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2 Sheets—Sheet 2.

W. L. HARDCASTLE.
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Witnesses.
Robert Emmett.
Thos. A. Green

Inventor:
William L. Hardcastle.
By James L. Norris.
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UNITED STATES PATENT OFFICE.

WILLIAM LYCURGUS HARDCASTLE, OF LAUREL HILL, TENNESSEE.

MECHANISM FOR BORING AND DRILLING WELLS.

SPECIFICATION forming part of Letters Patent No. 548,538, dated October 22, 1895.

Application filed August 22, 1895. Serial No. 560,111. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM LYCURGUS HARDCASTLE, a citizen of the United States, residing at Laurel Hill, in the county of De Kalb and State of Tennessee, have invented new and useful Improvements in Mechanism for Boring and Drilling Wells, of which the following is a specification.

My invention relates to mechanism for boring and drilling wells, my purpose being to provide novel and simple means whereby the bit or drill shall be automatically and intermittently turned or rotated in one direction between its successive strokes, so that it shall strike each time in a different place or at a different angle. It is my purpose, also, to provide means whereby the rotary movement of the bit or drill shall be regulated or controlled in its speed and range of movement without any variation in the stroke of the engine by which the tool is operated.

The invention consists to these ends in the several novel features of construction and in the parts and new combinations of parts hereinafter described, and then particularly pointed out and defined in the claims, the same constituting an attachment capable of application to any ordinary form of well-drilling machine.

To enable those skilled in the art to which my invention pertains to fully understand and practice said invention, I will proceed to describe the same in detail, reference being had for this purpose to the accompanying drawings, in which—

Figure 1 is a side elevation showing an ordinary well-drilling machine having my invention combined therewith. Fig. 2 is a detail perspective showing part of the drill-rotating mechanism, the supports for the same and the housing inclosing it being omitted. Fig. 3 is a vertical section of the box containing the eccentric clamps for the cable, showing the operation of said clamps and the means for regulating the tension of the spring by which their action is controlled. Fig. 4 is a plan view of the parts shown in Fig. 3. Fig. 5 is a side elevation of the box shown in Figs. 3 and 4, with the attached guide-frame, the lower end of the latter being in vertical section. Fig. 6 is a horizontal section of the parts shown in Fig. 1 upon the line 6 6.

The reference-numeral 1 in said drawings indicates the frame of a well-drilling machine of a known construction, having a derrick 2, provided with a pulley 3 at its top, over which passes the cable 4, by which the drill is raised after each stroke, its rise being effected by means of a lever 5, having a pulley 6 mounted thereon, under which the cable is led from the drum 6^a. The lever 5 is operated by a crank-pin 7, projecting from the face of a disk or wheel 8. The parts of the machine and the mode of operation are so well known that any further description of the well-drilling machine is unnecessary for the purposes of this specification.

I have shown my invention applied to a rope-machine, but it must be understood that it is equally applicable to a rod-machine, or a machine in which the drill is raised by an iron rod or a series of connected rods.

Upon the front of the derrick 2 at a suitable elevation I mount a housing 8^a, in which is horizontally arranged a ratchet 9, having crowning teeth, or, in other words, teeth which are cut or formed upon its upper edge, somewhat in the manner of a crown-gear. This ratchet is horizontally supported upon anti-friction-rolls 10, placed at suitable points, each of said rolls being provided with a collar 12, projecting above the horizontal bearing-face of the ratchet and centering the latter, as shown in Fig. 2. The circular form of the chamber in which the ratchet is placed will retain it in position should the collars 12 be omitted. Upon each side of the center of the ratchet 9 is a strong segmental plate 13, having a central diametrical opening 14. (Shown in Fig. 5.)

Within the opening 14 is placed the cable-guide frame consisting of two parallel bars 15, connected at their lower ends by parallel braces 16, an opening 17 for the cable being left between the braces, as shown in Fig. 6. Upon the upper ends of the parallel bars 15 is mounted a housing 18, within which upon opposite sides of the central vertical line are arranged two segmental clamps 19, having gear-teeth which intermesh, so that any movement imparted to one will be communicated to the other. In the adjacent edges or faces of these clamps are formed channels 20, which increase in depth from their lower to

their upper ends, whereby as the segmental clamps are revolved upward their clamping-faces will approach each other and when turned in the other direction they will recede or separate. The clamps are normally pushed upward by means of a spring 21, one end of which is fastened to the radial face of one of said clamps, the other end, the spring being bent upon itself, resting upon a cam 22, carried by a short shaft 23, which lies in a bearing in the wall of the housing. On the outer end of this shaft is a ratchet 24, which is held by a pawl 25, so that the force of the spring 21 can be regulated as circumstances may require.

The opening 14 is of such size that the parallel bars 15 lie loosely therein and may have a limited rotary play. The cable 4 is led between the clamps 19, which close upon it with a firm grip by the pressure of the spring 21. From the clamps the cable passes downward between the bars 15 and braces 16, and its end is secured to the drill or bit, which is shown in dotted lines in Fig. 1.

Upon the rearward face of the upright frame or derrick is mounted a housing 26 at a somewhat higher point than the housing 8^a. Within the housing 26 is arranged a rock-shaft 27, upon which are mounted two rigid lever-arms 28 and 29. From the arm 28 projects a duplex pawl 30, which enters the housing 8^a and engages the teeth of the ratchet 9, the relative length of the two pawls being such that both cannot mesh at the same time with the teeth of the ratchet, the purpose being to insure an operative engagement without regard to some variations in the range of movement of the lever-arms 28. It will readily be seen that when the rock-shaft 27 is operated the reciprocating of the duplex pawl will cause the ratchet 9 to have an intermittent or step-by-step rotation.

The lever-arm 29 is provided with a pawl 32, which engages a small ratchet 33, mounted on a shaft 34 within the housing 26. Upon the vertical face of this ratchet is a lifting-cam 35, which lies directly beneath the duplex pawl 30, so that at each revolution of the ratchet 33 said cam will lift the duplex pawl out of engagement with the teeth of the ratchet 9. The interval at which this action will take place may be varied by either varying the size of the ratchet 33 or by attaching the pawl 32 at a different point upon the lever-arm 29, which is provided with a plurality of apertures 36 for this purpose. The lever-arm 28 has a similar construction to enable the duplex pawl 30 to be attached at different points in order to vary the extent of its throw and increase or diminish the extent of each intermittent movement of the ratchet 9. A holding-pawl 37 prevents backlash of the ratchet 33. The rock-shaft 27 is operated automatically by a rigid lever-arm 38, which is operated by a connecting-rod 39, attached to the main lever 5. The lever-arm 38 is provided with a series of apertures 40, by which

the connecting-rod may be attached nearer to or farther from the rock-shaft 27, thereby increasing or diminishing its extent of movement.

The operation of the parts described is as follows: By vibrating the lever-arm 38, either by the action of the machine or by hand, the ratchet 9 is revolved step by step, the frame 15 15 being compelled to turn with it. The cable 4, being clamped between the segmental jaws 19, is twisted step by step by the movement of the ratchet 9, the twisting continuing until the lifting-cam 35 trips the duplex pawl 30 and allows the cable to untwist. By the time that this is accomplished the cam 35 will have passed and the pawl will again engage the teeth of the ratchet 9, the operation being repeated at intervals as long as the machine is in operation.

It will be observed from Fig. 3 of the drawings that the housing 18 and segmental clamps 19 can move upward upon the cable 4 without material resistance, as by such a movement the segmental clamps 19 will be caused to release their grip. Movement in the opposite direction, however, will be impossible. In order to preserve the housing 18 in proper position and at the same time permit the necessary feed to the drill, a spiral spring 41 is interposed between the top of the housing 8^a and the bottom of the housing 18. This spring receives the impact of the latter housing at each fall of the drill and automatically adjusts it in position upon the cable.

In the use of a rod-machine the same mechanism may be employed; but the pawl 32 will be removed from engagement with the ratchet 33, because no twisting and untwisting can take place with a rod of metal. With this single change, however, the operation is the same as that described, the rod and drill being rotated by a continuous intermittent movement.

My invention can be readily applied to any well boring or drilling machine in use with little trouble. It is not liable to get out of order, can be easily regulated to turn the drill rapidly or slowly, as circumstances require, and dispenses with the services of at least one man.

What I claim is—

1. An attachment for well-drilling machines, consisting of a horizontal ratchet having an opening for a guide-frame, a housing on the frame, spring-pressed clamps therein to engage the cable which lies within the frame, a pawl engaging the horizontal ratchet and operated by a connection from the drill-lifting lever, and means for tripping said pawl at suitable intervals to release the ratchet, substantially as described.

2. In an attachment for well-drilling mechanism, the combination with a horizontal ratchet of a guide-frame lying loosely in an opening in said ratchet, spring-pressed segmental clamps geared together upon the up-

per part of the said guide-frame and on opposite sides of the cable, a pawl engaging the teeth of the horizontal ratchet, a ratchet carrying a lifting cam lying beneath said pawl and a second pawl to operate the ratchet and advance its cam, substantially as described.

3. In an attachment for well-drilling machines, the combination with a horizontal ratchet having peripheral anti-friction bearings, of a guide-frame lying loosely in an opening in said ratchet, segmental clamps geared together on the upper part of said frame and having channels in their adjacent edges which deepen from their lower to their upper ends, a spring mounted upon one of said clamps, a cam to adjust the tension of said spring, a pawl engaging the teeth of the horizontal ratchet, a rock-shaft having two lever-arms provided at intervals with apertures for the pivotal attachment of the pawl, a small ratchet having a lifting cam lying beneath the said pawl, a second pawl adjustably

mounted on the second lever-arm and operating the small ratchet, and an arm connected to the drill-raising lever to operate the rock-shaft, substantially as described.

4. In a well drilling machine, the combination with a horizontal ratchet, of a guide frame lying loosely in an opening in said ratchet, segmental spring-pressed clamps upon said frame and on opposite sides of the cable, geared together and having channels which deepen toward their upper edges, a pawl to operate the horizontal ratchet and means for reciprocating said pawl and tripping the same at suitable intervals to release the ratchet, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM LYCURGUS HARDCASTLE.

Witnesses:

S. W. FOSTER,
A. W. P. LEE.