(No Model.) 2 Sheets—Sheet 1.

R. H. KERSEY.

WELL DRILLING MACHINE.

No. 558,877. Patented Apr. 21, 1896.

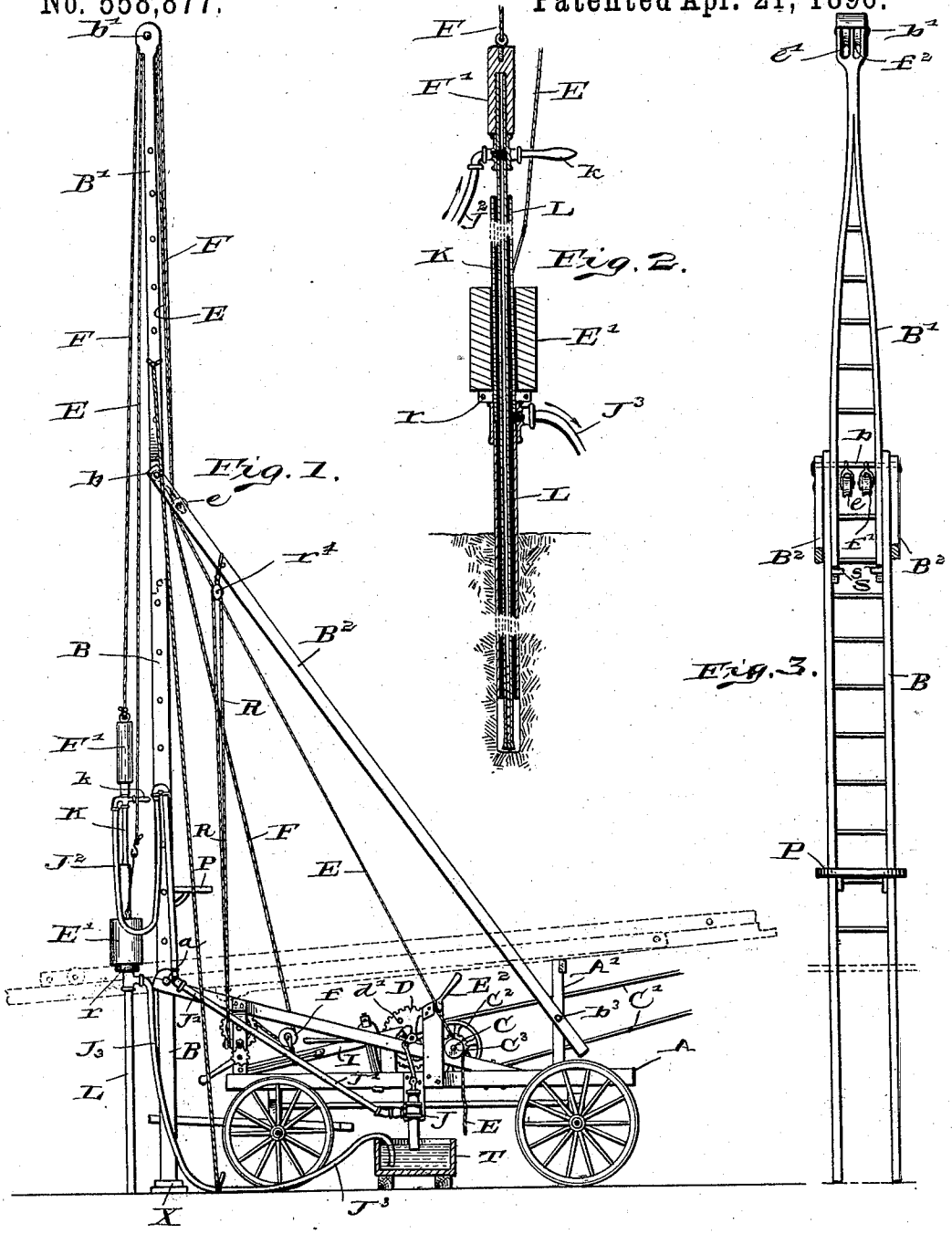

Fig. 1.

Fig. 2.

Fig. 3.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

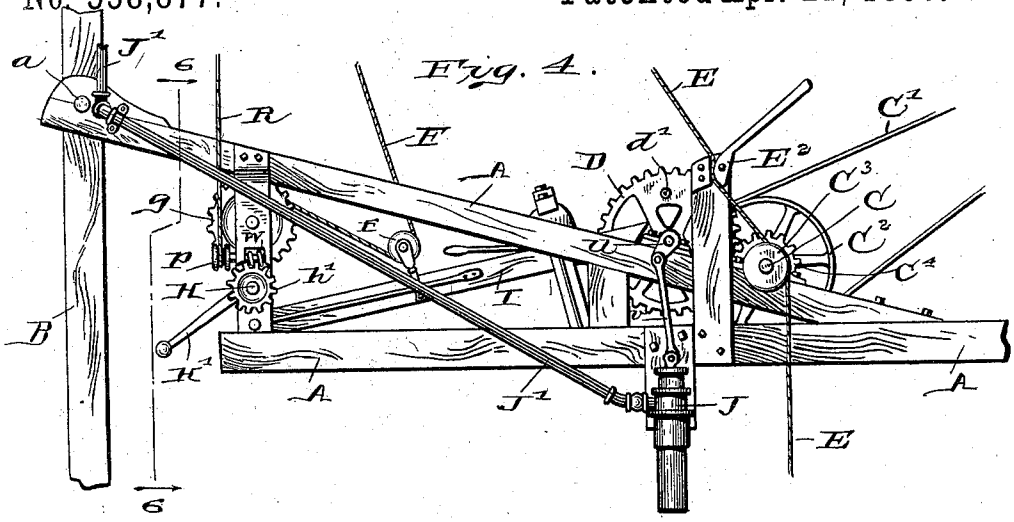


Fig. 5.

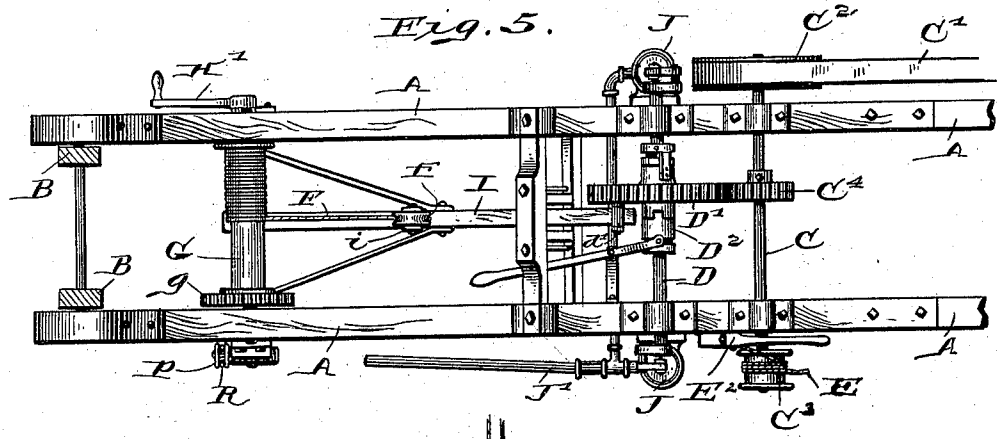
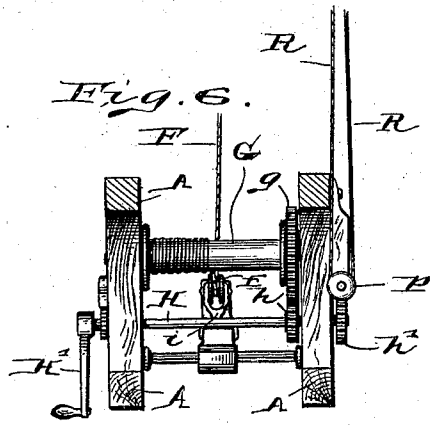


Fig. 6.



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ROBERT H. KERSEY, OF LEBANON, INDIANA.

WELL-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 558,877, dated April 21, 1896.

Application filed July 31, 1895. Serial No. 557,736. (No model.)

To all whom it may concern:

Be it known that I, ROBERT H. KERSEY, a citizen of the United States, residing at Lebanon, in the county of Boone and State of Indiana, have invented certain new and useful Improvements in Well-Drilling Machines, of which the following is a specification.

Said machine comprises a drill and apparatus for operating it, a tube and apparatus for operating it, and a pumping apparatus for forcing water into the aperture being drilled in the ground and, when mixed with the loosened earth, for drawing the mixed water and earth out again.

It also comprises a foldable derrick from which the driving-weights are suspended and a running-gear upon which the entire apparatus is mounted.

A machine embodying 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 of reference indicate similar parts, Figure 1 is a side elevation of a machine with the various devices in position and ready for operation; Fig. 2, a detail sectional view showing the well-tube and drill and driving-weights and fragments of the pump attachments in section; Fig. 3, a detail elevation of the detached derrick-frame; Fig. 4, a detail side elevation, on an enlarged scale, of a portion of the mechanism shown in Fig. 1; Fig. 5, a top or plan view of that portion of the machine illustrated by Fig. 4, and Fig. 6 a transverse vertical sectional view as seen from the dotted line 6 6 in Fig. 4.

In said drawings the portions marked A represent the main framework of the machine, which is commonly mounted on the running-gear and remains in position thereon, as shown; B B′ B^2, the several portions of the derrick-frame; C, the main driving-shaft; D, the pumping-shaft; E, the rope for operating the well-tube-driving weight; F, the rope for operating the drill-driving weight; G, a spool around which one end of the rope F is wound; H, a shaft for operating the spool G; I, a lever for operating the rope F; J, a pump; K, the drill-rod, and L the well tube or casing.

The framework A is preferably a rigid framework and is mounted on the bolsters of the running-gear, which latter may be of any usual or suitable wagon construction, being simply for the purpose of carrying the framework and the apparatus and mechanism mounted thereon and transporting the same from place to place. Said framework A, as will (so far as is necessary) be hereinafter specifically mentioned, contains or carries bearings for the various parts of the mechanism, and also supports for the derrick and braces, both in its extended or erected condition and when folded up for storage or transportation. A usual and preferred construction of this framework is shown in the drawings; but manifestly its construction may be varied as desired without in any wise affecting my invention.

The derrick is composed, preferably, of two uprights B and B′, hinged together by the pivot-shaft *b* and braces B^2, attached thereto preferably by the same pivot-shaft, and to standards A′ on the frame A by bolts b^3. When the upper section B′ is raised, its lower points come in contact with stops *s*, as shown most plainly in Fig. 3, by which said upper section is prevented from farther movement in that direction. When the derrick structure is taken down for storage or transportation, the upper section B′ is folded down, turning on the pivot *b*, by which it is connected to the frame B, the braces B^2 are entirely removed, the folded structure B B′ is tilted over on the pivot *b*, and the braces laid on top thereof, all as indicated by the dotted lines in Fig. 1. When the derrick structure is erected in position for use, its lower end rests on the ground or on a blocking or footing *x*, as shown, being of sufficient length below the pivot for the purpose. By this arrangement the main bearing or support for the structure in operative position is shifted from the running-gear to the ground, and said running-gear thus relieved of the greater portion of the weight and strain.

As will be noticed, the pivot connecting the two parts of the derrick is located at a point above the middle of its length, the top part being nearly half of the whole structure and of considerable weight. By this construction a derrick of unusual height may be raised and lowered with the ease required to

handle one of much less height of the ordinary construction, as it is raised first in the folded condition, preferably by connecting the upper ends of the braces and using them as lifts, and then the upper part is easily raised or turned up on the pivot by a rope running from its end over a part on the lower section and to a windlass. I thus provide a derrick which is of sufficient height to be most efficient for the purpose, and yet may be easily manipulated with little help and also be compactly packed on the running-gear.

The main driving-shaft C is mounted in suitable bearings on the frame A and is driven from some suitable source of power (not shown) by a belt C′, running to the pulley C^2 on said shaft. Said shaft also carries a spool C^3, and around this spool the rope E is wound sufficiently so that when the free end is held tight the spool will wind up the rope; but when the free end is left loose the spool will revolve freely and not operate upon the rope. By this means said rope E can be actuated to operate the weight E′, which, in turn, acts upon the well-tube—that is, when the free end of the rope E is held tight, as may readily be done by hand, the main portion of said rope will be wound up, raising said weight E′, and when the free end of said rope is released and left slack said weight will fall. This operation is only necessary at comparatively infrequent and somewhat irregular intervals, when it becomes necessary to sink the well tube or casing after the drill proper has penetrated a sufficient depth to render such sinking desirable. The greater portion of the work is, of course, done by the drill, which penetrates more or less rapidly, depending upon the character of the soil, and when by its use a sufficient amount of earth has been loosened and removed it requires but comparatively little time to sink the outer tube or casing into the space thus formed. A means is therefore required for this operation which shall normally remain idle, but may be manipulated at pleasure.

The shaft D is driven from the shaft C by means of the spur gear-wheel C^1, which is preferably fixedly mounted on the shaft C, and the spur gear-wheel D′, which is preferably loosely mounted on the shaft D and is enabled to drive said shaft when the clutch D^2 is thrown into engagement therewith, said clutch being of any usual or desired construction which is capable of moving longitudinally of the shaft, but is connected thereto by a spline or otherwise so as to revolve therewith. A pin d' extends out from the side of this wheel D′ and the lever I extends into the path of said pin, so that as said gear-wheel revolves said lever is operated by said pin during a portion of the revolution of said wheel and at a certain point in said revolution escapes therefrom. The lever being normally held upwardly by the pull of the weight F′ on the rope F, said lever is forced down by the wheel and raised by the weight with a regular motion. When the clutch D^2 is thrown into engagement, the shaft D is also revolved and the pumps J operated. This mechanism thus, when the clutch is engaged, subserves the double purpose of intermittingly pulling the rope F and regularly operating the pumps J at one and the same time when the clutch is engaged, or, when the clutch is disengaged, the single purpose of intermittingly pulling said rope at pleasure. It is obvious that the drilling operation in a machine of this character is the primary one, and therefore should be continuous, while the pumping and well-sinking operations must depend upon the rapidity of the work of the drill and may therefore be frequently suspended to advantage, especially when working in earth difficult of penetration.

The rope E, as has already been described, at its free end passes with a few turns around the spool C^3. It runs thence first under a sheave e, mounted on a shaft b^2, carried by the brace B^2, and thence over a sheave e', mounted on the shaft b, and thence down to and connects with the weight E′. Said weight E′, as shown most plainly in Fig. 2, is hollow and surrounds the upper end of the well tube or casing L and rests upon a driving clamp-ring r, attached to a point near the upper end thereof. The method of operating this rope and weight has already been described. The weight may also be sustained out of contact with the well-tube, when desired, by means of a grip composed of a surface on a projecting part on the frame A and a cam E^2, pivoted to the frame and adapted to force said rope against said surface, as shown most plainly in Fig. 4, and as will be readily understood.

The rope F passes from the spool G under a sheave f, carried by a stirrup i, connected to the lever I, thence under a sheave f, carried on the shaft b, thence over a sheave f^2 on the shaft b', and thence to the weight F′, which operates the drill. This weight F′, as shown most plainly in Fig. 2, preferably has a longitudinal perforation extending from its lower end up into its structure for a considerable distance, and the upper end of the drill-rod extends into this perforation and is secured therein, preferably, by a screw-thread formation, as shown.

The spool G is in itself a plain spool, and what would be otherwise the free end of the rope F is wound thereon to whatever extent may be desired, as is shown most plainly in Fig. 5. It is obviously necessary that as the operation of drilling proceeds this rope should be continuously unwound, so that as the drill sinks into the earth said supporting-rope may follow it without producing appreciable variation in its slack. It is also desirable to provide a means whereby, when necessary, the weight and drill can be speedily elevated or lowered. The shaft H is therefore provided, and for the last-mentioned purpose is an ordinary crank-shaft, and operates said spool G by means of the spur-gears h and g, which

are respectively fixed to said shaft and said spool. It is obvious that by turning the shaft H by means of its crank-handle H′ this latter operation is expeditiously performed. For the first-named operation I have provided a worm gear-wheel h' on the end of the shaft H, and an intermeshing worm w, which engages therewith. On the shaft of this worm is also a sheave or pulley p, and over this sheave or pulley runs the rope belt R, the upper end of which is carried by a sheave r', suspended from a point near the upper end of the brace B^2 or some other convenient point on the derrick. The operator commonly stands on a platform P, attached to the derrick, in convenient reach of this rope R, and in easily convenient sight of the weight F where it engages with the drill-rod. He is thus enabled to watch the operation of drilling and note the speed with which it progresses, and by means of this rope belt R can adjust the rope F as may be required, and can let out or slacken said rope with the utmost ease and, if desired, by almost imperceptible degrees.

The lever I is pivoted to the framework A, preferably at a point below the spool G and shaft H, and its otherwise free end extends out into the path of the pin d', by which it is operated. It is provided with a stirrup i, which carries the sheave f, as has already been described. Said stirrup i should be a swiveling stirrup, in order that its direction may change as the rope F is wound upon or unwound from the spool G.

The pumps J are or may be in themselves of any ordinary or desired construction. I prefer, for efficiency, to use two such pumps, one at each end of the shaft D, as shown, by which said shaft they are, as previously stated, operated through the medium of crank-arms u on the ends of said shaft, and links v connecting said crank-arms with the pistons of said pumps, all in an ordinary and well-known manner. A tank T is provided below the apparatus, into which the suction-pipes of said pumps extend, as shown most plainly in Fig. 1. The discharge-pipes J′ of said pumps run up alongside the derrick to a point near where the weight F′ operates upon the drill-rod K, and a flexible hose J^2 connects the upper end of said discharge-pipe with said drill-rod, which is hollow, as shown most plainly in Fig. 2. The suction-pipes of the pumps enter the tank T only a slight distance, and thus draw the water from the top, where it is comparatively free from dirt, and force it through the pipes J′ and hose J^2 into the hollow drill-rod, and thence to the bottom of the well, where said water aids in loosening the dirt, and is thence forced up around the open space outside the drill-rod and inside the well tube or casing to the top of said casing, whence it is discharged, carrying the loosened dirt with it back into the tank T through the hose J^3. The water is thus used over and over again, being forced into the well in a comparatively clear condition and forced out of the well, carrying the loosened dirt with it, through the well tube or casing L and hose J^3, back into the tank, whence said dirt can be shoveled or otherwise removed from time to time, as may be desired.

The drill-rod K and well-casing or tube L are or may be each of any usual or desired construction, except that, of course, for the purpose above described, the drill-rod K must be hollow, which otherwise would not need to be the case. A handle k is secured to the drill at about the point where the hose J^2 is attached thereto, to enable the operator to revolve it and thus secure uniform results at the bottom. Said operator, as before described, stands on the platform P in convenient reach of this handle.

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

1. The combination, in a well-drilling machine, of a running-gear mounted on wheels, a fixed framework mounted on said running-gear, a derrick mounted on said fixed framework by means of a pivot connection, which derrick is composed of two sections hinged together, the upper section being of less length than the lower section, braces connected at one end to the main, or lower, section of said derrick and at the other end to a portion of said fixed framework, whereby said derrick is supported, the lower or main part of said derrick extending beyond the pivot connecting it to the fixed frame a distance sufficient so that it will rest upon the ground when erected, all substantially as set forth.

2. The combination, in a well-drilling machine, of the main driving-shaft, a second or pumping shaft, a loosely-mounted wheel on said second or pumping shaft, means of driving said wheel from said driving-shaft, a shifting-clutch on said second or pumping shaft adapted to be engaged with or disengaged from said wheel, mechanism for operating the drill-weight rope, and a strike on said loosely-mounted wheel on said pumping-shaft, which contacts with and operates said mechanism at each revolution thereof whereby the operation of drilling and pumping may be caused to proceed simultaneously or separately, substantially as shown and described.

3. The combination, in a well-drilling machine, of a running-gear, a framework mounted on said running-gear, a foldable derrick pivoted to said fixed framework, a driving-shaft mounted on said framework having a spool on its end, a rope mounted on said derrick and carrying the well-tube-driving weight at one end, the other end of said rope being wound about the spool on said shaft with a free end extending therefrom, a second or pumping shaft, a loosely-mounted wheel on said second shaft, a shifting-clutch mounted upon and adapted to drive said shaft and

also adapted to engage with and be driven by said wheel, the pumps, pitmen driven by cranks on said shaft and operating said pumps, a pivoted lever carrying a sheave under which the drill-weight-carrying rope passes, and a pin or arm on said wheel adapted to come into contact with and operate said lever, said shaft being thus adapted to operate the drill-weight alone, or both the drill-weight and the pumps, all substantially as shown and described.

In witness whereof I have hereunto set my hand and seal, at Indianapolis, Indiana, this 27th day of July, A. D. 1895.

ROBERT H. KERSEY. [L. S.]

Witnesses:

CHESTER BRADFORD,

JAMES A. WALSH.