R. M. BRADFORD.

WELL DRILLING RIG.

APPLICATION FILED APR. 19, 1919.

1,329,500.

Patented Feb. 3, 1920.

3 SHEETS—SHEET 1.

Fig. 1.

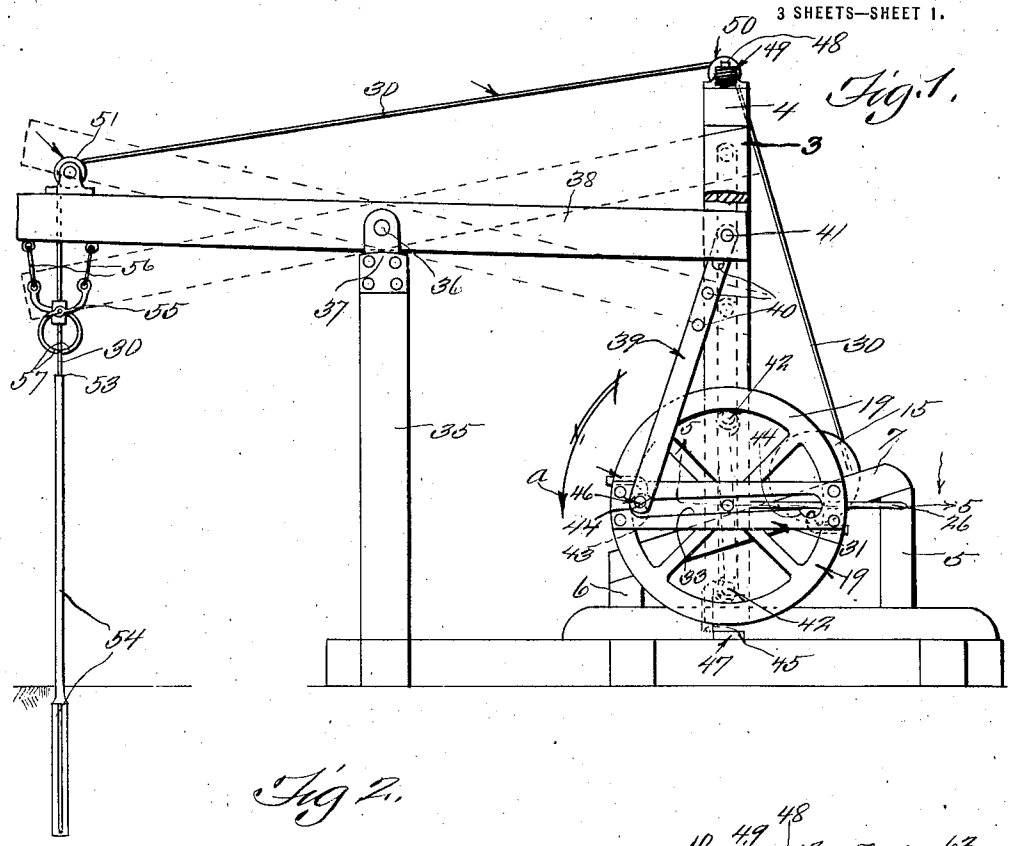
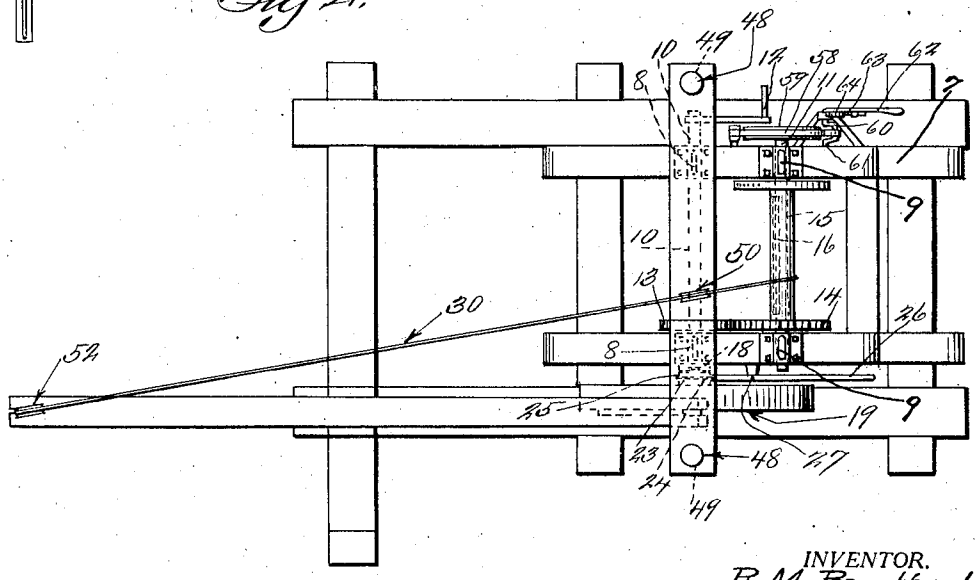


Fig 2.



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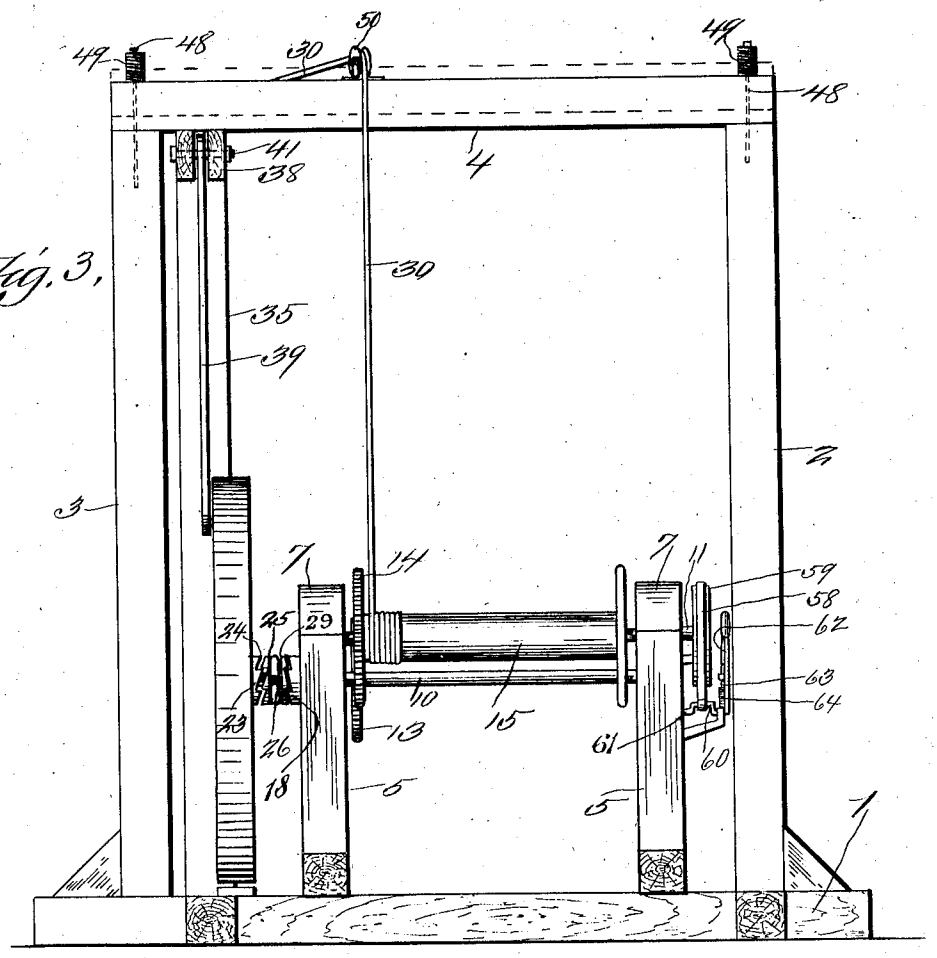
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3 SHEETS—SHEET 2.

Fig. 3.



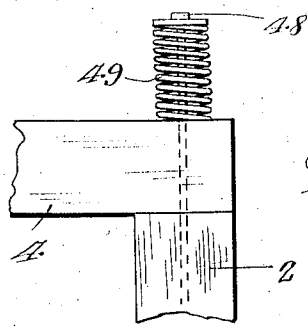


Fig. 6.

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3 SHEETS—SHEET 3.

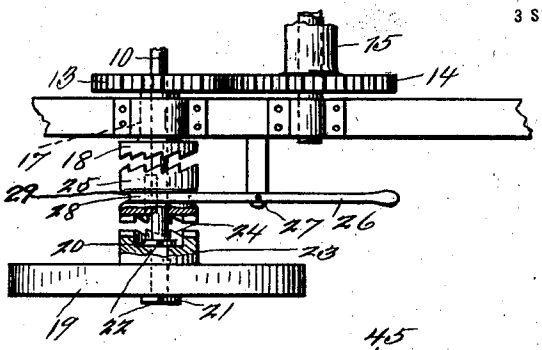
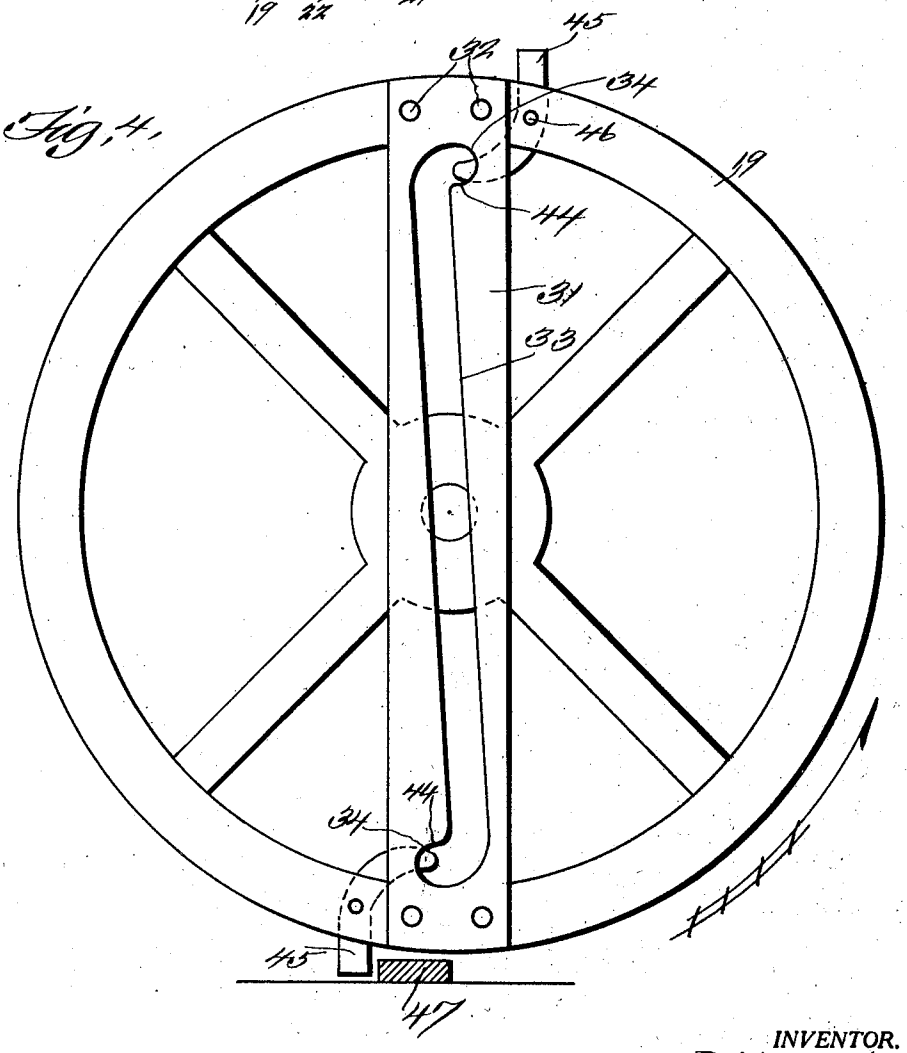


Fig. 5.

Fig. 4.



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UNITED STATES PATENT OFFICE.

ROBERT M. BRADFORD, OF BEAUMONT, TEXAS.

WELL-DRILLING RIG.

1,329,500. Specification of Letters Patent. Patented Feb. 3, 1920.

Application filed April 19, 1919. Serial No. 291,307.

To all whom it may concern:

Be it known that I, ROBERT M. BRADFORD, a citizen of the United States, residing at Beaumont, in the county of Jefferson and State of Texas, have invented certain new and useful Improvements in Well-Drilling Rigs, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to the art of drilling, and particularly to an improved well drilling rig or apparatus, and the invention aims to provide a simple, efficient and practical machine of this kind including revoluble means having a device operatively connected to a walking beam (from which a drilling tool is suspended), so that upon every complete revolution of the revoluble means, the drilling tool or bit will be given two direct drops, each alternating with the lifting movement of the drill or bit.

The invention further aims to provide a device carried by the revoluble means, so that at every half revolution of the revoluble means, said device engages a member on a link to raise the walking beam and at the end of each of such half movements of the revoluble means, to release said device from the link automatically, and allow the beam to oscillate automatically through the gravitation of the drilling tool or bit.

The invention further aims to provide means to insure the automatic release of the device from the link at the end of each of said half revolutions.

The invention further aims to provide means for raising the drilling tool or bit to its normal position after the well has been drilled.

While the design and construction at present illustrated and set forth is deemed preferable, it is obvious that as a result of a reduction of the invention to a more practical form for commercial purposes, the invention may be susceptible to changes, and the right to these changes is claimed, provided they are comprehended within the scope of what is claimed.

The invention comprises further features and combination of parts, as will be hereinafter set forth, shown in the drawings and claimed.

In the drawings:

Figure 1 is a view in side elevation of the improved well drilling rig constructed in accordance with the invention, showing the upright 3 broken away and a part thereof omitted.

Fig. 2 is a plan view.

Fig. 3 is a view in elevation at right angles to that shown in Fig. 1.

Fig. 4 is an enlarged detail view in elevation of the revoluble member or wheel for operating the walking beam.

Fig. 5 is a sectional view on line 5—5 of Fig. 1.

Fig. 6 is an enlarged detail view of one of the uprights 2, the crossbeam 4 and the connections 48 and 49 for the beam 4.

Referring more especially to the drawings 1 designates a base frame, rising outwardly from which is a second frame, comprising the upright beams 2 and 3, which are connected at their upper ends by the crossbeam 4. Also rising from the base frame is another frame comprising the vertical beams 5 and 6, the beams 5 extending higher than the beams 6, and being connected to the beams 6 by means of the inclined beams 7. Mounted in bearings 8 and 9 of the beams 7 are shafts 10 and 11, and the shaft 10 is provided with a crank 12. Loose upon the shaft 10 is a gear 13, the teeth of which mesh with the teeth 14 of one of the flanges of a drum 15, which is keyed or otherwise made fast as at 16 to the shaft 11. The gear 13 is provided with a hub 17, which engages one of the bearings 8, and the end of the hub of the gear 13 is provided with a clutch member 18. Also loose upon the shaft 10 is a wheel 19, there being collars 20 and 21 secured by pins 22 on the shaft 10, to prevent axial movement of the wheel 19. A hub 23 is formed integral with the wheel 19, and is chambered out for the reception of the collar 20. This hub 23 is provided with clutch teeth 24. Splined or keyed to the shaft 10 intermediate the clutch hub of the wheel 19 and the clutch member 18 is an intermediate clutch member 25. A lever 26 is pivoted to a projection of one of the upright frames, as at 27, and one end of the lever is provided with forks 28 engaging the usual groove 29 of the clutch member 25, whereby the clutch member may be shifted either in gear with the clutch member 18 or in gear with the teeth 24 of the clutch member 23. It is obvious that when the clutch member 25 is in gear with the clutch 18, and the shaft 10 rotated, by means of the crank 12, or by auto-

matic means (not shown), revoluble movement will be imparted to the gear 13. This movement will be transmitted to the drum 15, in order to wind thereon a cable 30. When the clutch member 25 is shifted in the opposite direction to engage the teeth of the clutch member 23, the wheel 19 will be rotated.

A plate 31 is positioned transversely of the wheel 19, that is across the diameter of the wheel, and has its opposite ends secured to the wheel at 32 at diametrically opposite points. This plate is provided with an elongated slot 33, which is formed slightly obliquely in the plate. The opposite ends of the slot 33 are provided with offset curved ends 34 extending in opposite directions. An upright beam 35 is mounted upon the base frame and pivoted at 36 between the bearings 37 (which are on the upper end of the upright 35) is a walking beam 38. A link 39 is provided, and has a plurality of apertures or openings 40, any one of which may receive a pin 41, whereby the link 39 may be adjustably and pivotally suspended on the walking beam. The lower end of the link 39 has a lateral pin 42, on which a roller 43 is journaled. This roller operates in the slot 33 of the plate 31. It is to be seen that by constructing the curved ends of the slot 33 offset in the manner shown, shoulders 44 are formed. When the clutch member 25 is moved so as to engage the teeth of the clutch hub 23 of the wheel 19, and the shaft 10 is rotated, either by hand or by automatic means, the wheel 19 will revolve, and assuming that the end of the walking beam carrying the link is in its uppermost raised position, and the wheel 19 is positioned so that the slot 33 is disposed as shown in Fig. 4, the roller 43 is in a position to enter one of the offset curved ends of the slot 33. Movement of the wheel 19 in the direction of the arrow *a* will pull downwardly upon the link 39, and consequently tilt the walking beam 38, until the end of the beam carrying the link will assume its lowermost position. Instantly after the end of the walking beam carrying the link reaches its lowermost position, the roller 43 will slip off the shoulder 44 of one of the offset curved ends of the slots, thereby allowing the walking beam to oscillate through the medium of the gravitation of the drilling tool or bit. In order to insure disengagement of the roller 43 from the shoulder, a dog 45 is pivoted at 46 to the wheel 19, there being one adjacent each end of the plate 31. The nose of each dog is positioned adjacent the extremity of the curved end of the slot 33, while the tail of the dog approaches a slight distance beyond the periphery of the wheel in order to be in the path of the abutment 47, which is on the base frame. It is to be apparent that when the roller 43 disengages the shoulder 44, and the roller moves upwardly through the slot 33, and it will come in contact with the nose of the dog, and position the tail of the dog, in order to insure position of the same in the path of the abutment 47. As the wheel 19 rotates, and when a pulling action is imparted to the link 39 upon a half revolution of the wheel 19, the tail of the dog will strike the abutment 47, causing the nose to push against the roller 43, and positively disengage it from the shoulder 44, allowing the roller to move upwardly through the slot, the roller becoming positioned in engagement with the other laterally curved end of the slot. As the wheel 19 rotates, these movements of the link and the action of the roller and the dog are consecutively repeated. Owing to these movements the walking beam will be constantly oscillated, imparting dropping and raising movements to the drill or bit. By removing the pin 41 from the uppermost opening or aperture 40 of the link 39, and adjusting it in one of the other openings, said link may be adjusted with relation to the walking beam, thereby changing the stroke of the beam. The crossbeam 4 is mounted on the bolts or rods 48, which are threaded into the upright beams 2 and 3. Coil springs 49 are interposed between the ends of the beam 4 and the heads of the bolts or rods 48, thereby allowing the beam 4 to yield under the impacts of one end of the walking beam 38, that is, should the drill tool or bit strike soft ground. In other words, the beam 4 constitutes a buffer.

A pulley 50 is mounted upon the upper face of the beam 4, and the cable 30 passes thereover, and also over the pulley 51, which is mounted on the outer end of the walking beam 38. This cable 30 passes downwardly through a notch 52 of the outer end of the walking beam, and is connected in any suitable manner at 53 to the upper end of the drill tool or bit 54. An S-clamp 55 is suspended by the members 56 from the lower face of the outer end of the walking beam 38, and between the jaws 57 of the pivoted members of the S-clamp, the cable 30 passes. It is to be noted that as the beam oscillates, the drilling tool or bit is alternately raised and allowed to drop through the force of gravitation, and through the medium of the successive impacts of the drill or bit into the ground, the well may be drilled. As the drill or bit is allowed to drop delivering its impacts, the cable will gradually feed out, as the well deepens. As the walking beam is tilted, in order to raise the drill or bit, the members or parts 56 will tension or become taut, closing the jaws 57, causing the biting parts of the jaws to clamp the cable, and raise the drill or bit. In order to regulate the outward feed of

the cable from the drum 15, a brake mechanism is provided. This brake mechanism consists of a friction wheel on one end of the shaft 11, and a brake band 58 frictionally engaging the friction wheel 59. One end of this brake band is fixed to the frame, and the other end is connected to a member 60, which is mounted upon the stub shaft 61, there being a lever 62 carried by the member 60, whereby the member may be rocked, to tighten the brake band frictionally in contact with the friction wheel. The lever 62 is provided with the usual mechanism, consisting of the hand grip operated dog 63 and a rack 64, to hold the lever in different adjusted positions. By means of the manipulation of the lever, the friction between the brake band and the friction wheel may be increased or decreased, thereby governing the feeding out of the cable. After completely drilling the well, and it is desired to raise the drill or bit, the clutch member 25 is moved out of engagement with the teeth of the clutch hub 23, and then moved in engagement with the clutch member 18. The shaft 10 is rotated, and owing to the gear connections 13 and 14, the drum 15 will be operated to wind the cable 30 thereon, and lift the drill or bit from the well.

The invention having been set forth, what is claimed as new and useful is:

1. In a well drilling rig, the combination with an oscillatory walking beam, of a drilling tool or bit suspended from its outer end, a supporting frame for the walking beam, a link connected to the inner end of the walking beam, a revoluble member, and a connection between the link and the revoluble member, whereby a pulling action and an automatic release is effected on the link every half revolution of the revoluble means, whereby the drilling tool or bit is allowed to drop intermittently with its rising movement, and tripping means to effect a positive release of the connection of the link at the end of every half revolution of the revoluble means.

2. In a well drilling rig, the combination with a frame, of an oscillatory walking beam mounted on the frame and having suspended from its outer end a drilling tool or bit, a link connected to the inner end of the walking beam, a revoluble member provided with a plate having a diagonal slot, an anti-frictional means carried by the lower end of the link and operable in the slot, the opposite ends of the slot having means, whereby engagements and disengagements of the anti-frictional means are effected with the opposite ends of the slot during the half revolution of the revoluble means, and at the end of every half revolution for raising and dropping the drill tool or bit, and an element carried by the revoluble member adjacent each end of the slot, and adapted to be tripped to cause a positive disengagement of the anti-frictional means.

3. In a well drilling rig, the combination with a frame, of an oscillatory walking beam mounted on the frame and having suspended from its outer end a drilling tool or bit, a link connected to the inner end of the walking beam, a revoluble member provided with a plate having a diagonal slot, an anti-frictional device carried by the lower end of the link and operable in the slot, the opposite ends of the slot having means, whereby positive engagements and disengagements of the anti-frictional means are effected with the opposite ends of the slot during the half revolutions of the revoluble means, and at the end of every half revolution, for raising and dropping the drill tool or bit, and means carried by the revoluble member to afford a positive disengagement of the anti-frictional means from the ends of the slot.

4. In a well drilling rig, the combination with a frame having an upright, of an oscillatory beam fulcrumed on the upright, a well drill or bit, a cable connected to the drill or bit and engaging a pulley on the outer end of the walking beam, a link adjustably connected to the inner end of the walking beam, a revoluble member having a plate extending across the diameter thereof, and provided with a rectangular slot having offset portions extending in opposite directions, the lower end of the link having an anti-frictional device engaging in said slot, and adapted to engage and disengage the offset lateral end portions of the slot during every half revolution of the revoluble member, whereby the drill may be raised and allowed to drop through the force of gravitation at the end of every half revolution of the revoluble member, and means on which the cable is wound, for raising the drill tool or bit after completing the well, and means to effect a positive release of the anti-frictional means from the ends of the slot at the end of each half revolution of the revoluble member.

5. In a well drilling rig, the combination with a frame having an upright, of an oscillatory beam fulcrumed on the upright, a well drill or bit, a cable connected to the drill or bit and engaging a pulley on the outer end of the walking beam, a link adjustably connected to the inner end of the walking beam, a revoluble member having a plate extending across the diameter thereof, and provided with a rectangular slot having offset portions extending in opposite directions, the lower end of the link having an anti-frictional device engaging in said slot, and adapted to engage and disengage the offset lateral end portions of the slot during every half revolution of the revoluble

member, whereby the drill may be raised and allowed to drop through the force of gravitation at the end of every half revolution of the revoluble member, and means on which the cable is wound, for raising the drill tool or bit after completing the well, and means to effect a positive release of the anti-frictional means from the ends of the slot at the end of each half revolution of the revoluble member and a tripping device for the positive releasing means, and means on the frame to act as a buffer for the walking beam as the drill tool or bit drops, in order to relieve the impacts of the walking beam.

6. In a well drilling rig, the combination with a frame, of an oscillatory walking beam fulcrumed thereon and provided with a drilling tool suspended from its outer end, revoluble means on the frame and provided with an elongated slot having offset shoulders at its opposite ends extending in opposite directions, a connector on the inner end of the beam and having a device engaging said slot and adapted to engage said shoulders every half revolution of the revoluble means to tilt the beam for raising the tool, elements carried by the revoluble means adjacent the opposite ends of the slot, each adapted to alternately cause a disengagement of the device with one of the shoulders every half revolution of the revoluble means, to cause a positive drop of the tool, and tripping means arranged in the path of said elements to cause a positive actuation of the elements.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

ROBERT M. BRADFORD.

Witnesses:
A. BABIN,
WM. W. HUFF.