Sept. 12, 1950 G. C. TOWER 2,522,412

WELL-DRILLING MACHINE

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Fig. 1.

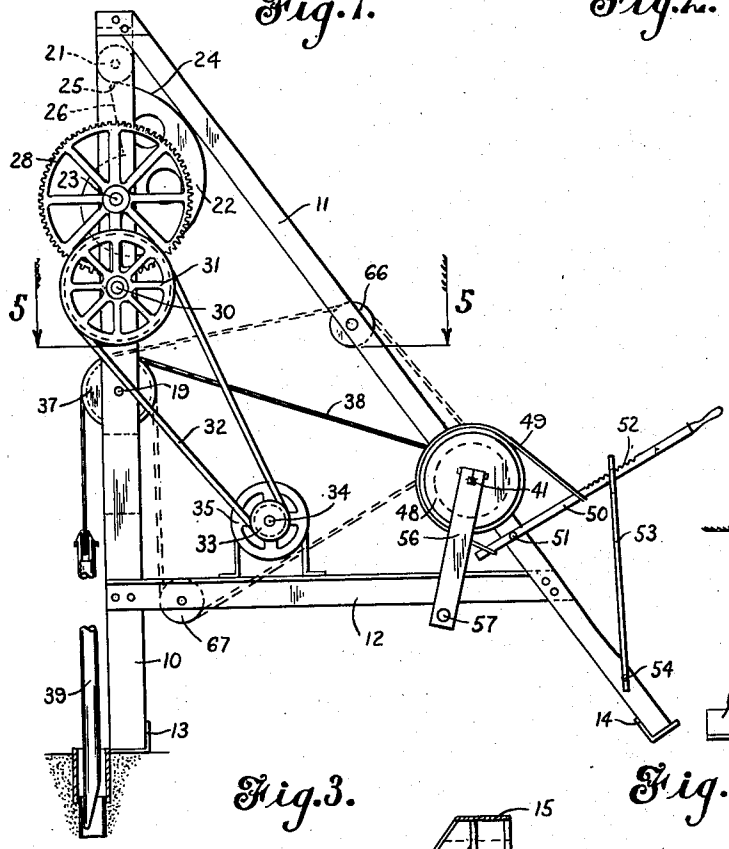


Fig. 2.

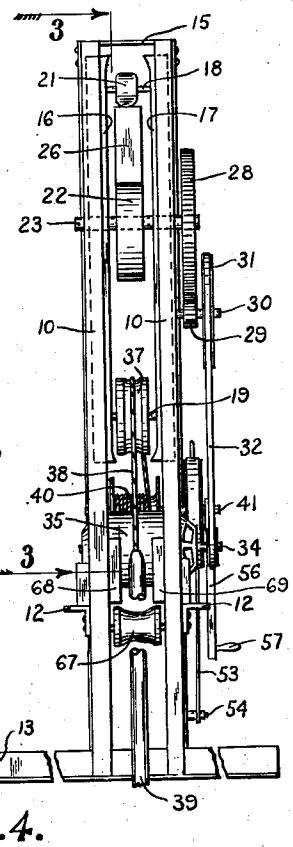


Fig. 3.

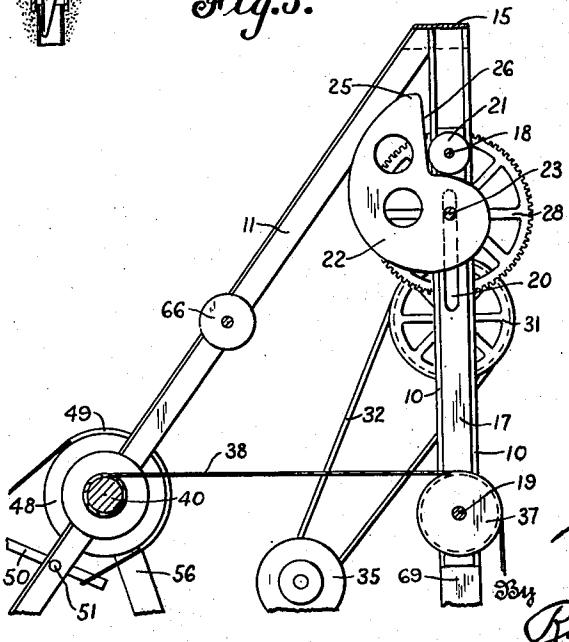
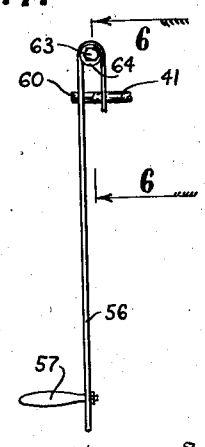


Fig. 4.



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Fig. 5.

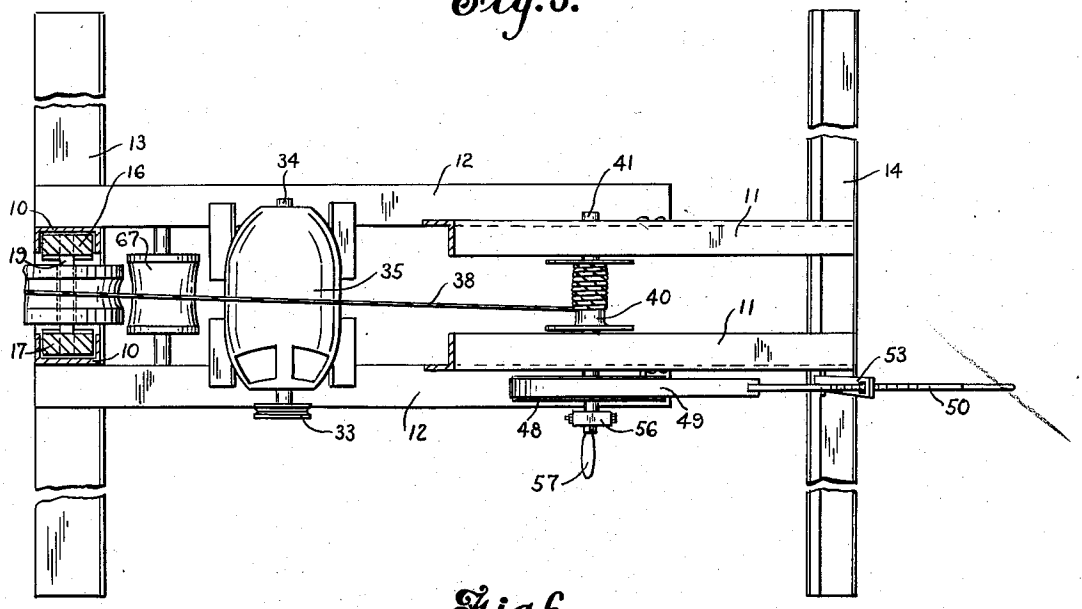
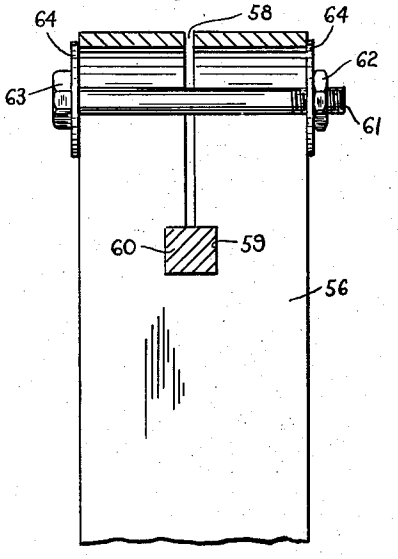


Fig. 6.



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WELL DRILLING MACHINE

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3 Claims. (Cl. 255—10)

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This invention relates to well-drilling machines and other like devices, such as certain percussion tools, where a tool is raised and dropped upon the work. Therefore, while illustrated in connection with a well-drilling rig, it will be understood that the principles of the invention are equally applicable to other tools of similar character.

The drilling of wells, whether deep or relatively shallow, is somewhat expensive due to the fact that the apparatus required usually entails a considerable investment. It is contemplated by the present invention to provide a well-drilling apparatus of very simple construction, so that it may be manufactured and sold at a relatively low cost, and, at the same time, the device will be efficient in operation and will also have all of the functions required in a device of this character.

In carrying out my invention, I provide a frame of generally triangular shape upon which the mechanism is mounted, the frame supporting a slide upon which is carried the cable by which the tool, in this case a drill, is suspended. Cam means are provided for raising the slide to an elevated position and permitting it to drop by gravity, so that the tool is urged by gravity against the face of the work.

A source of power is also mounted on the frame, and means are provided for adjusting the distance through which the tool is raised, so that the force of the resulting stroke may be regulated. Also, as will be obvious in a device of this kind where the tool is carried by or suspended upon the end of a cable, it is necessary in the drilling of a well, for example, for the length of the cable to be gradually increased as the depth of the drilling increases. In the present device, this increase in the length of the cable may be automatically effected, so that little attention on the part of the operator is required in a drilling operation.

One object of the present invention is to provide a new and improved well-drilling or like machine of simple and inexpensive character.

A further object of the invention is to provide a well-drilling machine having a frame in which is mounted a slide supporting the drilling tool, the slide being raised by cam means rotatably mounted in the frame and then permitted to drop to effect contact of the tool with the work.

A further object of the invention is to provide a well drill or like apparatus of the character described in which provision is made for adjusting the distance through which the tool is raised without varying the length of the stroke of the slide.

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A still further object of the invention is to provide a device of the character described in which the tool is suspended by a cable trained over a pulley, which pulley is in turn carried by a reciprocating slide, and to provide means for paying out the cable from a drum or the like as needed, depending upon the depth of the drilling.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a side elevational view of a well-drilling apparatus embodying my invention;

Fig. 2 is a front elevational view thereof;

Fig. 3 is a sectional view on line 3—3 of Fig. 2;

Fig. 4 is a front elevational view of the drum handle;

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

Fig. 6 is a sectional view on line 6—6 of Fig. 4.

To illustrate a preferred embodiment of my invention, I have shown in the drawings a frame comprising a pair of substantially upright members 10, to the upper end of each of which is secured an inclined member 11 extending downwardly to substantially the same level as the lower ends of the upright members 10, and connecting each pair of members 10 and 11 are horizontally disposed members 12, thus completing a substantially triangular frame, each of the members of which are arranged in spaced pairs.

To the lower ends of the members 10 is secured a horizontally extending foot member 13, and, likewise, to the lower ends of the members 11 is secured a horizontally extending member 14, both members 13 and 14 being designed to rest upon the ground so as to give the frame a stable support. Also, the upper ends of the upright members 10 may be secured together by a transverse member 15 (Fig. 2) in order to provide a stable support.

As shown more especially in Figs. 2 and 3, the upright members 10 are U-shaped or channel-shaped in cross section with the channels facing each other, so that these channels form guideways for a reciprocating slide. This slide is formed by the spaced parallel members 16 and 17, one mounted within the channel of each of the upright members 10. The members 16 and 17 are secured together adjacent their upper ends by a rod or shaft 18, and, likewise, at their lower ends by a rod or shaft 19, and each of the members 16 and 17 is provided with a longitudinal slot 20 (Fig. 3).

Upon the upper shaft 18 is rotatably mounted a

cam follower in the form of a roller 21, which roller is urged by gravity downwardly into engagement with the surface of a cam 22 secured to a shaft 23, which shaft is rotatably mounted in the upright members 10, and, as shown in Fig. 3, extends through the slots 20 in the members 16 and 17 of the slide, so that the slide may reciprocate with respect to the shaft as permitted by the length of the slot.

It may be noted that the cam is of the eccentric form, and is provided with a spirally formed external surface 24 with which the roller 21 is in engagement, this surface terminating at a high point 25 from which a substantially radially disposed surface 26 extends toward the axis of the shaft 23. Thus, it will be apparent that, when the roller 21 is in the position shown in Fig. 1 and the cam 22 moves in a clockwise direction from that position, the roller 21 will be caused to drop downwardly by gravity along the substantially radially extending portion 26 of the cam, which will then be in a substantially vertical position, the roller dropping to the position shown in Fig. 3. This will permit the slide to drop from its raised position to its lowermost position in which the tool engages the work.

Upon the shaft 23 is secured a gear 28, the teeth of which are in mesh with those of a pinion 29 secured to a stud shaft 30 mounted on one of the frame members 10. Secured upon the stud shaft 30 is a pulley 31 around which is trained a belt 32, which belt is also trained around a pulley 33 carried by the drive shaft 34 of a source of power 35 which may be a gasoline engine or electric motor, for example. By mounting this power source upon the frame, the device will be self-contained, so that power will not be required from an outside source.

Rotatably mounted upon the shaft 19 adjacent the lower end of the slide is a pulley 37 about which is trained a cable 38 to the free end of which is secured the tool 39, which in the present instance is a drill. The cable 38 is wound upon a drum 40 (Figs. 2 and 5), this drum being carried by a shaft 41 rotatably mounted in the inclined members 11. The shaft 41 is extended at one end, and upon this extended end is mounted a brake drum 48, which is embraced by a brake band 49, the ends of which are connected to a lever 50 pivoted at 51 to the adjacent inclined member 11. The lever 50 is provided with ratchet teeth 52 adapted to be engaged by a link 53 pivoted at 54 to the inclined member 11, this link being adapted to hold the lever 50 in any adjusted position, so that the brake band may be tightened or loosened with respect to the drum.

In order that the drum 40 may be rotated manually to reel-up or pay-off the cable 38, a crank 56 is provided, this crank carrying a handle 57. As shown in Figs. 4 and 6, the upper end of the crank is reversely bent in U-shaped form, and this part of the crank is slotted, as shown at 58, and is also provided with registering openings 59 to receive the outer end of the shaft 41. The extreme end of this shaft is squared, as shown at 60 (Figs. 4 and 6), and the opening 59 in the outer part of the crank is of similar shape, so that there will be no tendency of the latter to rotate upon the shaft. The two portions of the crank on either side of the slot 58 may be clamped together by means of the bolt 61 and nut 62 carried thereby. The head 63 and the nut of the bolt bears against washers 64 which engage the outer edges of the U-shaped portion of the crank.

It will be seen that tightening the nut 62 will urge these two parts of the crank toward each other, so as securely to clamp the crank upon the shaft 41.

It is desirable to provide for adjustment of the stroke of the tool, and this may be done by varying the direction or the length of the cable 38 between the drum 40 and the pulley 37. For this purpose additional pulleys 66 and 67 are provided upon the frame. As will be apparent when the cable is trained around the pulley 67, it extends in a substantially vertical direction to the pulley 37, and, therefore, when the slide is raised together with the pulley 37, the drill will be raised through a distance substantially twice as great as that through which the slide is raised.

The pulley 66 is above the pulley 37, even when the latter is in its uppermost position, and when the cable is passed around the pulley 66, the drill will be raised through a considerably lesser distance than that through which the slide is raised, thus giving the shortest stroke to the tool. When, however, the cable passes directly from the drum 40 to the pulley 37, a stroke will be provided which is intermediate in length to that provided when the cable is trained around the pulleys 66 and 67.

Upon the inside of the upright member 10 are provided stop blocks 68 and 69 in position to engage the lower ends of the slide elements 16 and 17 when the latter is in its lowermost position. Usually, of course, the drill will drop upon the work. When, however, the depth of the drilling is such as to be at the limit of the length of the cable 38, these stops will prevent the cam follower 21 from striking the cam when the slide drops.

While I have shown and described a preferred embodiment of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the claims.

What I claim is:

1. In a device of the character described, a frame comprising a pair of spaced upright members channel-shaped in cross section, said members being disposed with the channel in one member facing that in the other member, a slide movably mounted between said members, said slide comprising spaced elements mounted in said channels and means for rigidly holding said elements in spaced relation, a cam rotatably mounted between said spaced upright members, a cam follower mounted between, and rotatably supported by, said spaced elements and adapted to follow the peripheral surface of the cam, a pulley rotatably mounted between said spaced elements of the slide adjacent the lower portion thereof, a cable passing over said pulley, said cable having a depending end carrying a drill, and means on the frame to which the other end of said cable is attached.

2. In a device of the character described, a frame comprising a pair of spaced upright members channel-shaped in cross section, said members being disposed with the channel in one member facing that in the other member, a slide movably mounted between said members, said slide comprising spaced elements mounted in said channels and means for rigidly holding said elements in spaced relation, a cam rotatably mounted between said spaced upright members, a cam follower mounted between, and rotatably supported by, said spaced elements and adapted to follow the peripheral surface of the cam, a

pulley rotatably mounted between said spaced elements of the slide adjacent the lower portion thereof, a cable passing over said pulley, said cable having a depending end carrying a drill, means on the frame to which the other end of the cable is attached, and a pulley mounted on the frame to change the direction of said cable in its passage from said attaching means to the pulley on the slide.

3. A well-drilling rig comprising a substantially triangular frame, each of the legs of which comprises a pair of spaced-apart members, one of said pairs of members being substantially vertical and having guideways in their opposing faces, a slide comprising spaced elements, one of which is mounted in each of said guideways, a roller rotatably mounted between said slide elements, a cam rotatably carried by the vertical members of the frame and disposed between said

slide elements in position to engage said roller, a pulley carried by the slide between the spaced elements threof, a drill-supporting cable trained over said pulley, and means for rotating said cam.

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