R. R. SANDERSON.

WELL DRILLING DEVICE.

APPLICATION FILED NOV. 15, 1910.

993,882. **Patented May 30, 1911.**

2 SHEETS—SHEET 1.

Fig. 4.

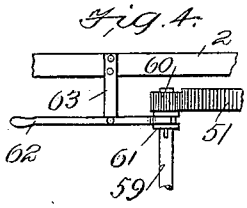
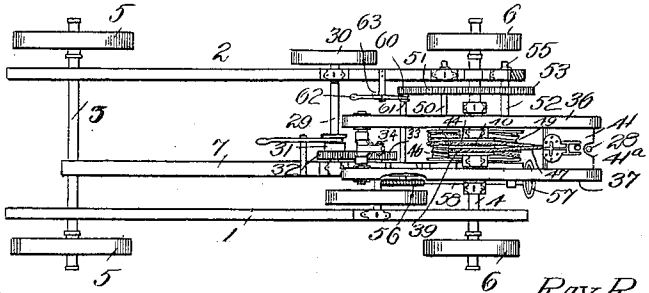


Fig. 1.

Fig. 3.

Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 5.

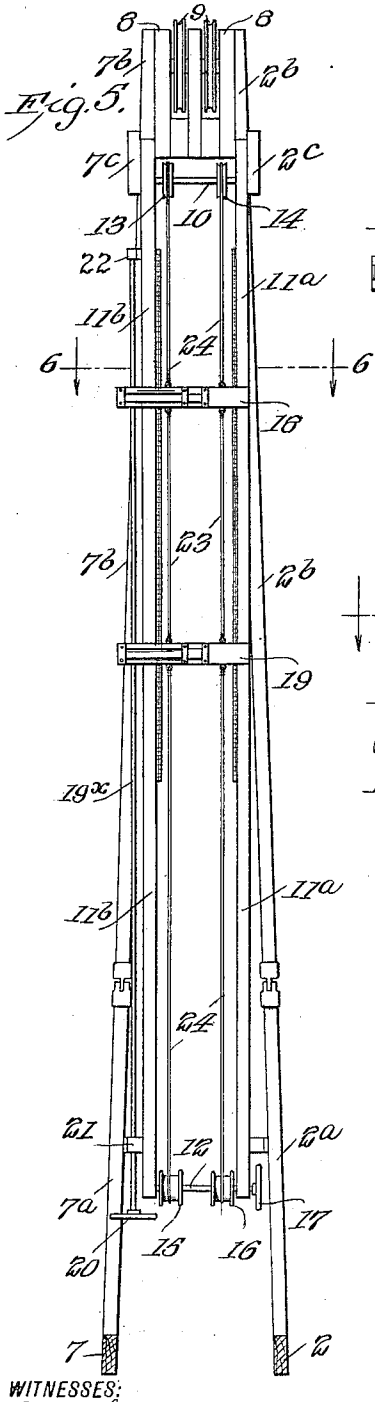


Fig. 7.

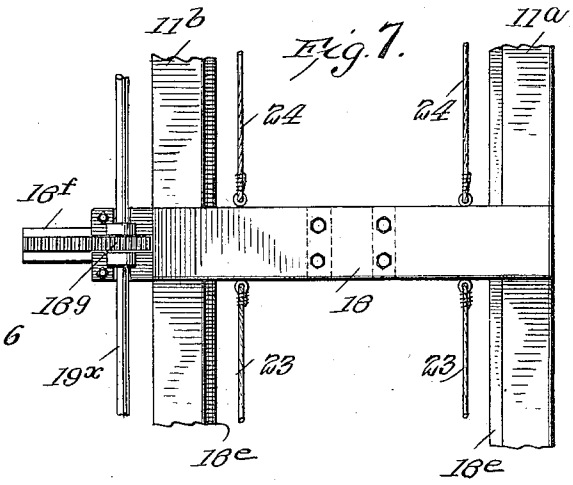


Fig. 6.

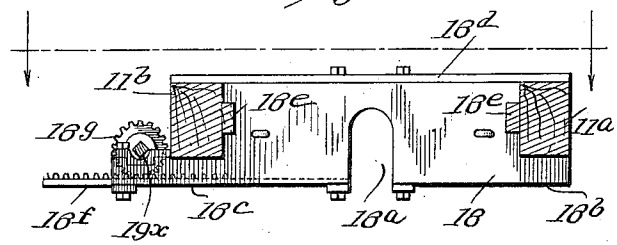


Fig. 8.

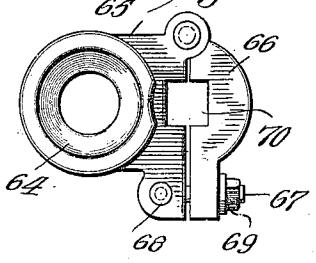
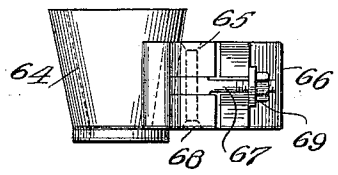


Fig. 9.



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WELL-DRILLING DEVICE.

993,882. Specification of Letters Patent. Patented May 30, 1911.

Application filed November 15, 1910. Serial No. 592,470.

To all whom it may concern:

Be it known that I, RAY R. SANDERSON, a citizen of the United States, and a resident of Orrville, in the county of Wayne and State of Ohio, have made certain new and useful Improvements in Well-Drilling Devices, of which the following is a specification.

My invention relates to improvements in well drilling machinery, and it consists in the combinations, constructions and arrangements herein described and claimed.

An object of my invention is to provide a device of the walking beam type, in which the rapidity of the oscillations of the drill rod may be considerably increased without sacrificing its effectiveness in any particular, thereby rendering the machine capable of doing more work in a given time than the ordinary drilling device.

A further object of my invention is to provide novel means for guiding the drill rod in its reciprocatory movement.

A further object of my invention is to provide novel means of feeding the drill rod.

A further object of my invention is to provide a novel form of securing and elevating means. This latter consists of a pair of ropes which may be clamped to the drill rod and by which the latter is operated, one rope serving to hoist the rod and the other to positively project it downwardly.

Other objects and advantages will appear in the following specification and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings in which—

Figure 1 is a side elevation showing one embodiment of my invention, certain parts being shown in section, Fig. 2 is a plan view of the device, Fig. 3 is a detail view showing the eccentric bearing for certain gears, Fig. 4 is a detail view showing a slidable gear, Fig. 5 is a front view of the mast and guide frame for the drill rod, Fig. 6 is a sectional view in detail along the line 6—6 of Fig. 5, looking in the direction of the arrows, Fig. 7 is a rear view of a portion of the device looking in the direction of the arrows, as indicated in Fig. 6, Fig. 8 is a plan view showing one of the rope clamping devices, and Fig. 9 is a side view of the clamp shown in Fig. 8.

In carrying out my invention I provide a frame portion consisting of the side members 1 and 2 which are supported upon the axles 3 and 4, respectively, of the rear wheels 5 and the front wheels 6. The axles 3 and 4 also support a longitudinally disposed sill 7. Secured to the forward ends of the members 2 and 7 are the respective uprights 2^a and 7^a, as shown in Fig. 5, and hinged to the respective uprights 2^a and 7^a are the side members 2^b and 7^b which constitute portions of the mast or derrick. At the top of the mast between the side members 2^b and 7^b (see Fig. 5) are a series of spacing blocks 8 between which are pivotally mounted the pulleys or wheels 9. As will be seen from Figs. 1 and 5, the mast members 2^b and 7^b have a pair of forwardly projecting plates 2^c and 7^c respectively, through which a rod 10 extends. This rod forms the pivotal member of a guide frame for the drill rod, this guide frame consisting of the following parts.

Referring now particularly to Fig. 5, it will be noted that hinged to the rod 10 are the two side members 11^a and 11^b. These side members are connected at their lower ends by a rod 12. Upon the rod 10 are two pulleys 13 and 14, while upon the rod 12 are a pair of small drums 15 and 16. The hand wheel 17 is secured to the rod 12 for operating the drums. Slidably secured to the frame members 11^a and 11^b are the upper and lower adjustable guide bars 18 and 19 respectively. These guide bars are both similar to that shown in Figs. 6 and 7 and a description of one will suffice for them both, since, as stated, they are the same. In Fig. 7, the bar 18 is provided with a central recess 18^a. At the ends, it is provided with the respective lateral extensions 18^b and 18^c. These extensions bear on their respective side members 11^a and 11^b. A guide plate 18^d is secured to the rear side of the bar 18 and bears on the rear of the side members 11^a and 11^b. In order to further guide the movement of the guide bar 18, I provide the guide strips 18^e, the plate 18^a being notched to receive these guide strips, as shown in the figure. In the extension 18^c is a slidable rack bar 18^f whose inner end is arranged to close the open end of the recess 18^a, but which is arranged to be retracted so as to leave the guide bar in the condition shown in Fig. 6, ready for the entrance of the drill rod. This is accomplished by means of a pinion 18^g. Passing

through the center of the pinion is a rod 19^x which extends downwardly and terminates in a hand wheel 20 (see Fig. 5). The rod is carried in suitable bearings 21 and 22. As stated above, the guide bar 19 is similar to the guide bar 18. These two guide bars are connected together by means of the cables 23. The guide bar 18 is suspended from the pulleys 13 and 14 by means of the cables 24. These cables pass over the pulleys 13 and 14, thence downwardly and around the drums 15 and 16, thence upwardly, and are attached to the lower side of the guide bar 19. The rod 19^x extends through the gears of the guide bars 18 and 19, corresponding to 18^g, so that both of these gears are operated when the hand wheel 20 is shifted. The mast is braced by suitable brace rods 25. At the bottom of the guide frame are the pivoted arms such as that shown at 26 in Fig. 1. These arms are provided with forward and rear notches 26^a and 26^b which are adapted to engage the bar 27, so as to hold the guide frame in adjusted positions. As has been stated the drill rod 28 is arranged to reciprocate being guided by the guide bars 18 and 19. The means for reciprocating the drill rod constitutes an important part of my invention, and is as follows: Journaled on the sills 2 and 7 is a shaft 29 bearing a power wheel 30 on one end and being connected by a clutch 31 with a gear 32. This gear is arranged to mesh with another gear 33, which is provided with a crank arm 34. To the latter is attached a pitman 35, which is pivotally connected at its top with the two members 36 and 37 that constitute the walking beam. These latter members are pivoted at 38 upon a common support and are arranged to be reciprocated by the movement imparted to them through the mechanism connected with the power wheel 30 just described. Disposed between the two members 36 and 37 of the walking beam are the two segmental sheaves 39 and 40. One of these sheaves 39 is shown in Fig. 1, and both of them are shown in Fig. 2 in plan view. At the upper end of the walking beam and central thereof, upon a plate 41, is secured an upper half sheave 42 and a lower half sheave 43. The purpose of these sheaves is to guide the ropes for hoisting the drill rod up or projecting it downwardly. The hoisting rope, I have shown at 44. It is secured by means of a clamp 45 to the drill rod 28, passes over the half sheave 43, over the segmental sheave 40 and thence downwardly around a drum 46 (see Fig. 2). The other rope 47 is secured by means of a clamp 48 to the drill rod 28, passes downwardly underneath the half sheave 42, over the segmental sheave 39, thence downwardly and forwardly to a drum 49. The drum 46 is on a shaft 50, which bears a gear 51, while the drum 49 is on a shaft 52 bearing a gear 53. Normally these two gears are in mesh, but the gear 53 is provided with an eccentric bearing for its shaft 52. This eccentric bearing is shown at 54 in Fig. 3. The outer end of the bearing is squared as shown at 55, so that when the latter is turned the shaft 52 may be moved toward or away from the shaft 50 of the gear 51, thereby throwing these two gears out of or into mesh. In order to operate the drums 46 and 49, I provide a worm and gear device 56 which may be actuated by a hand wheel 57 on a rod 58. The gear 56 is upon a shaft 59, which bears a loose gear 60 arranged to mesh with the gear 51. This loose gear 60 has a grooved collar 61 which may be engaged by a lever 62 on an arm 63 attached to the sill 2, so that the gear 60 may be moved into and out of mesh with the gear 51.

Referring now to Figs. 8 and 9 I have shown therein the rope clamping means. This consists of a conical receptacle 64 carried upon a main body portion 65 to which is hinged a clamping portion 66. The latter may be clamped by means of a bolt 67 which is pivoted at 68 upon the main body portion and which bears a clamping nut 69. Both the body portion 65 and the clamping portion 66 are recessed at 70 to receive the drill rod.

From the foregoing description of the various parts of the device the operation thereof may be readily understood.

The apparatus is drawn to the place where the drilling operation is to be conducted. The hinged mast is raised and braced by the bracing member 25 in the ordinary manner. The swinging guide frame is drawn back and held in its rear position by the engagement of the notch 26^b with the bar 27. It is thus out of the way when the drill rod has to be hoisted. This is done in the ordinary manner by attaching ropes to the drill rod and elevating it by passing these ropes over the pulleys 9 to a suitable power device (not shown). When the rod has been raised to the proper height, the swinging frame is now brought forward, the racks of the guide bars having been previously set, by means of the hand wheel 20, in the position shown in Figs. 6 and 7. The drill bar now enters the guide slots like that shown at 18^a. The hand wheel 20 is now turned so as to cause the racks (similar to 18^f) to close the slots. In Fig. 5, these slots are shown as closed. The ropes 44 and 47 are now secured to the clamping devices 45 and 48, respectively. The common means for securing these ropes is to knot them, and place the knotted end so that it will engage in the receptacles 64. The upper clamping mechanism is shown in Figs. 8 and 9. The lower one is precisely the same except that it is reversed. The clamping members are secured to the drill rod, the ropes having

been previously wound around their respective drums as already described. The drill now being in readiness, the clutch 32 is thrown in and the walking beam begins to vibrate. As will be seen from Fig. 2, the plate 41 is notched at 41ª to receive the drill rod 28. As the outer end of the walking beam moves upwardly the rod is raised by means of the rope 44, and as it moves downwardly the rod is positively projected downwardly by means of the rope 47. It should be noted that the walking beam is pivoted at 38 and that the centers of the ropes pass in line with the centers of the pivotal supports 38, and, consequently there is no decrease or increase of the tension on the ropes during the reciprocatory movement of the walking beam. Owing to the fact that the rod does not have to fall down by its own weight, but is actually projected downwardly by the movement of the walking beam, the speed of the latter may be considerably increased. In my device I am able to return it very rapidly, the stroke of the drill being approximately eight or ten inches.

The feed of the drill downwardly is accomplished by means of the hand wheel 57. This hand wheel, as stated, operates the worm and gear 56, which in turn operates the gears 51 and 53 of the drums 46 and 49, respectively. The drum 46 upon which is wound the rope 44 is turned so that it plays out the rope 44, while the drum 49 is turned so as to wind up the rope 47. The tension of the rope is thus maintained at all times. When the rod has descended for a distance of approximately five feet, (although this may of course be varied, depending upon where the rope is clamped to the rod,) the eccentric bearing of the gear 53 is turned, so as to bring the gear 53 out of mesh with the gear 51. The gear 60 is now slid along on the shaft 59 out of mesh with the gear 51 on the other side. The ropes 47 and 44 may now be freed from the drill rod by unloosening the clamps. The rope 47 may now be pulled upwardly, while the rope 44 and the clamp 45 are also pulled upwardly. It will be borne in mind that one rope, *i. e.*, the rope 47 is being played out and the other rope 44 is being wound up. These ropes may be clamped again to the rod and the operation may be repeated.

Referring now to Fig. 5, I have shown the means for shifting the guide bars. These guide bars together with the guide plate 41 form one guiding means for the drill rod. By turning the hand wheel 17 the two guide bars 19 and 18 are shifted downwardly, so as to vary the movement of the rod. Now when the rod gets beyond the guide bar 18, the two guide bars are shifted upwardly, the guide bar 18 passing off of the rod, and the guide bar 19 being adjusted so as to guide the upper end of the bar which is now closer to the guide slot 41ª of the plate 41.

It will thus be seen that I have provided a device in which the drill rod is actually projected downwardly and yet is done so by means of ropes or cables. It is obvious also that the operations of feeding and shifting the guide bars may be done without stopping the device, it being only necessary to stop the device when the ropes are to be clamped at different positions along the bar.

I claim:

1. In a drilling device, a frame, a walking beam pivotally secured thereto, a mast, a guide-frame pivotally suspended from said mast, means for retaining the guide-frame in position, a drill rod arranged to be guided by said guide-frame, and flexible connections between said drill rod and said walking beam for positively actuating the drill rod upwardly and downwardly.

2. In a drilling device, a frame, a walking beam pivotally arranged upon said frame, a reciprocating drill rod, guiding means therefor, and flexible connections between said walking beam and said drill rod for positively moving the latter upwardly and downwardly.

3. In a drilling device, a frame, a walking beam pivotally arranged upon said frame, a reciprocating drill rod, guiding means therefor, flexible connections between said walking beam and said drill rod for positively moving the latter upwardly and downwardly, and means for feeding the drill rod during its reciprocation.

4. In a drilling apparatus, a frame, a walking beam pivotally mounted thereon, a reciprocating drill rod, flexible connections secured to said drill rod, means carried by said walking beam and engaging said flexible connections for positively actuating the drill rod in its reciprocatory movements, means for feeding forward the drill rod, said means including the flexible connections and means for maintaining a constant tension on the flexible connections.

5. In a drilling apparatus, a frame, a walking beam pivotally mounted thereon, a reciprocating drill rod, flexible connections secured to said drill rod, means carried by said walking beam and engaging said flexible connections for positively actuating the drill rod in its reciprocatory movements, means for feeding forward the drill rod, said means including the flexible connections and means for maintaining a constant tension on the flexible connections, said means comprising a pair of segmental sheaves having their upper portions disposed in alinement with the pivotal connection of said walking beam, for receiving the flexible connections, and drums upon which the flexible connections are wound.

6. In a drilling apparatus, a frame, a

walking beam pivotally mounted thereon, a reciprocating drill rod, flexible connections secured to said drill rod, means carried by said walking beam and engaging said flexible connections for positively actuating the drill rod in its reciprocatory movements, means for feeding forward the drill rod, said means including the flexible connections and means for maintaining a constant tension on the flexible connections, said means comprising a pair of segmental sheaves having their upper portions disposed in alinement with the pivotal connection of said walking beam, for receiving the flexible connections, and drums upon which the flexible connections are wound, and means for rotating said drums in opposite directions so as to unwind one flexible connection and to wind on the other.

7. In a drilling device, a frame, a walking beam pivotally secured thereto and having on one end a pair of half sheaves, one of said half sheaves projecting upwardly and the other half sheave projecting downwardly, a drill rod, guide means therefor, a pair of segmental sheaves having their upper portions disposed in alinement with the pivotal point of said walking beam, a pair of drums, means for actuating said drums in opposite directions, said means comprising a pair of meshing gears, a third gear arranged to mesh with one of said gears and a worm, a gear for actuating said third gear, and a pair of flexible operating members adapted to be adjustably secured to said drill rod, one of said flexible members passing underneath the upper sheave on said walking beam, over one of said half sheaves and around one of said drums, and the other flexible connection passing over one of said half sheaves, around one of said segmental sheaves and being wound around the other drum.

8. In a drilling device, a frame, a drill rod, a mast secured thereto, a guide-frame pivotally suspended from said mast, means for swinging said guide-frame into and out of its normal working position, and for retaining it in its shifted positions, movable guide bars having slots arranged to receive said drill rod, means for reciprocating said drill rod and means for simultaneously shifting said guide bars during the movement of the drill rod.

9. In a drilling device, a frame, a mast secured thereto, a drill rod, a guide-frame for said drill rod pivotally suspended from said mast, means for retaining said guide-frame in position, a plurality of guide bars movably secured on said guide-frame and provided with alined slots adapted to receive said drill rod, and means for simultaneously closing the alined slots to prevent the displacement of the drill rod.

10. In a drilling device, a frame, a mast secured thereto, a drill rod, a guide-frame for said drill rod pivotally suspended from said mast, means for retaining said guide-frame in position, a plurality of guide bars movably secured on said guide-frame and provided with alined slots adapted to receive said drill rod, and means for simultaneously closing the alined slots to prevent the displacement of the drill rod, said means comprising rack bars carried by said guide bars arranged to be projected across one end of said slots, pinions carried by said guide bars for actuating said racks and a common actuating rod for said pinions, said rod being loosely connected with said pinions to permit a movement of said guide bars relatively to said actuating rod.

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Witnesses:
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