G. S. MINSHALL.

WELL DRILLING APPARATUS.

APPLICATION FILED SEPT. 13, 1920.

1,396,649.

Patented Nov. 8, 1921.

3 SHEETS—SHEET 1.

Fig. 1.

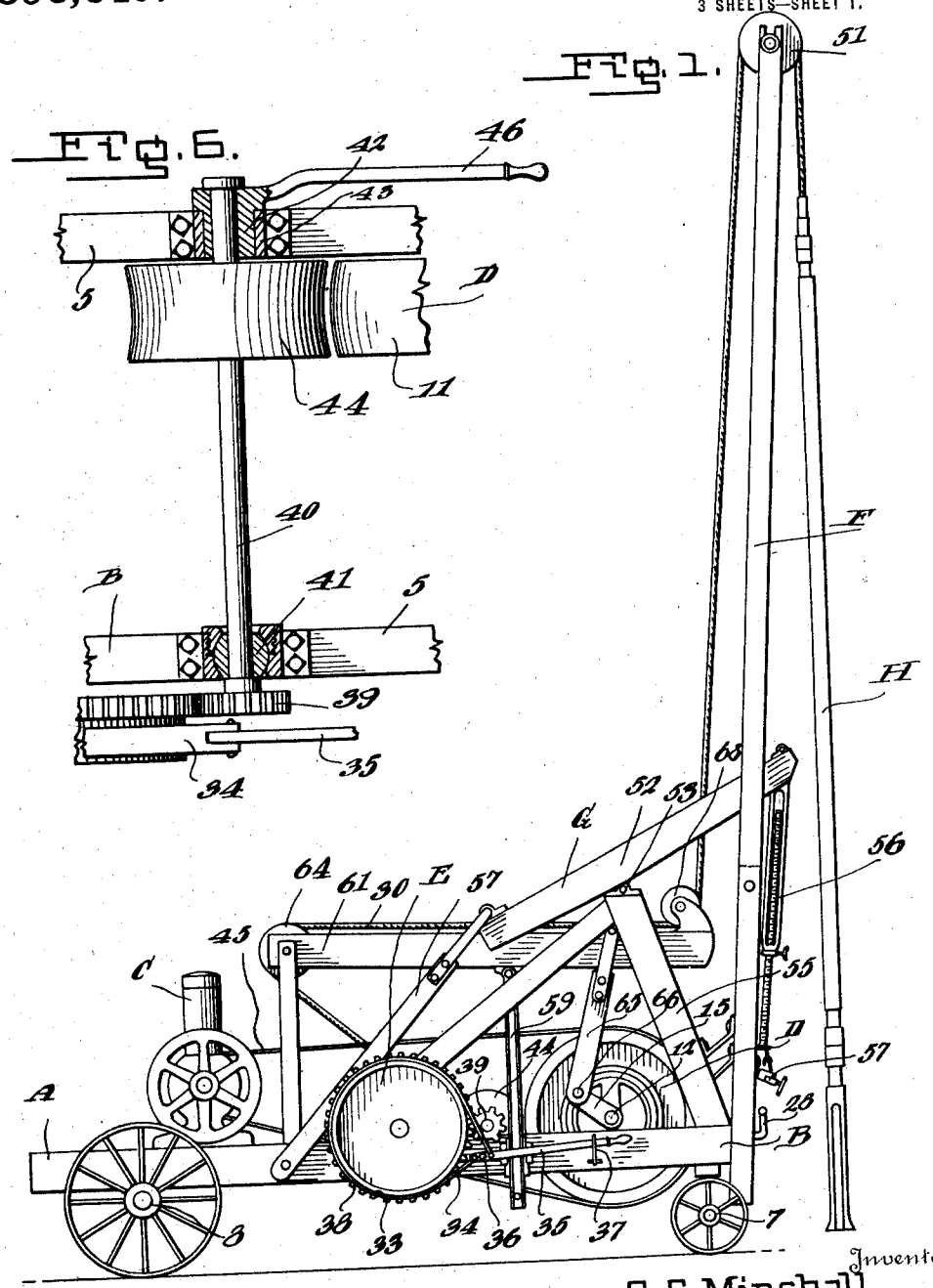


Fig. 6.

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3 SHEETS—SHEET 2.

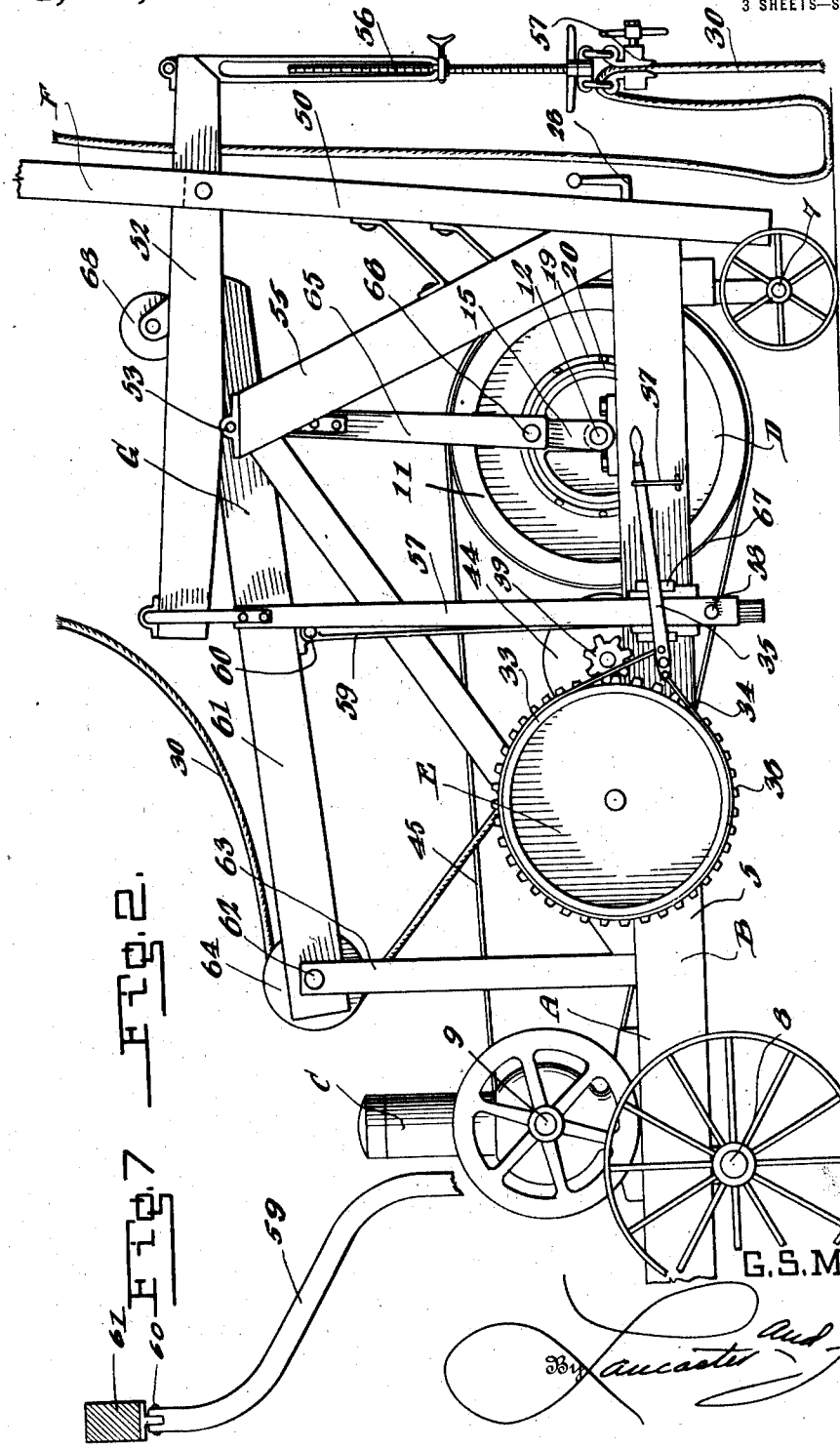


Fig. 2.

Fig. 7

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3 SHEETS—SHEET 3.

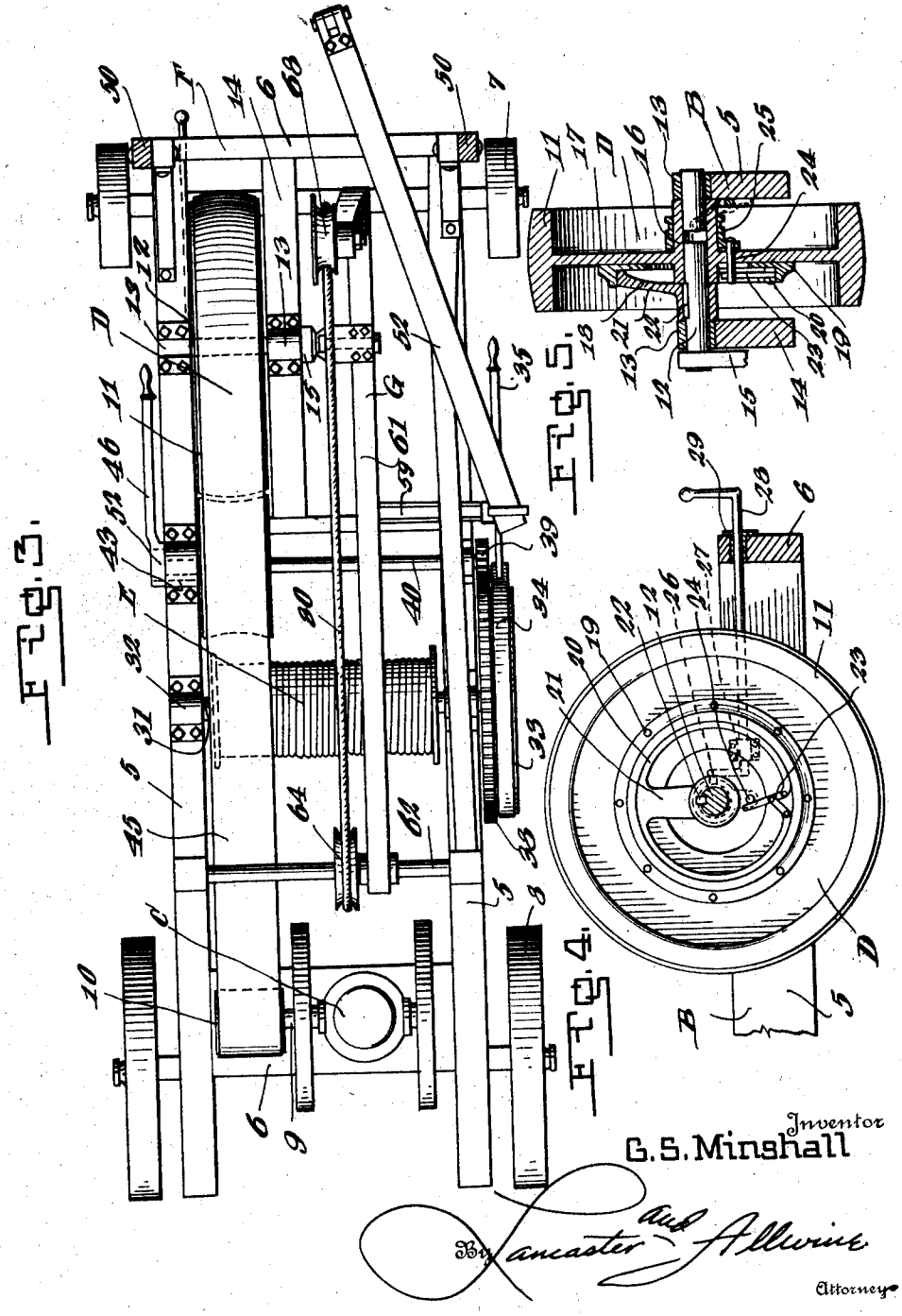


Fig. 3.

Fig. 5.

Fig. 4.

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UNITED STATES PATENT OFFICE.

GEORGE S. MINSHALL, OF BOWLING GREEN, KENTUCKY.

WELL-DRILLING APPARATUS.

1,396,649. Specification of Letters Patent. Patented Nov. 8, 1921.

Application filed September 13, 1920. Serial No. 409,802.

To all whom it may concern:

Be it known that I, GEORGE S. MINSHALL, a citizen of the United States, residing at Bowling Green, in the county of Warren and State of Kentucky, have invented certain new and useful Improvements in Well-Drilling Apparatus, of which the following is a specification.

This invention relates to well digging apparatus of the type operating a string of tools usually consisting of a bit, sinker bar and rope socket, by raising them the length of the stroke and then letting them drop to the bottom of the hole, the bit by this, cutting into the rock each successive operation, and the primary object of the invention is to provide means for counter-balancing the string of tools on the working downward stroke so as to prevent the racing and sudden straining of the motor.

In well digging apparatus of this character, the crank in raising the tools has a tendency to slow down during the upward stroke of the tools when the engine supports the weight thereof and then gains speed in the downward stroke of the tools when the engine is free from the weight thereof. This brings the crank in a position to lift the tools before they have delivered the full force of their stroke. If the power of the engine is throttled down until the crank begins to lift the tools, at the proper moment, to counteract the increase in speed, the engine will not have power to raise the tools without lagging or slowing down during the upward stroke of the tools. It is therefore an object of this invention to provide a counter-balance beam for the well apparatus so arranged as to absorb the excess power delivered by the engine during the downward stroke of the tools and to deliver this power to the tools during the upward stroke.

A further object of the invention is to provide an improved counter-balance for well digging apparatus which permits the speeding up of the machine, so that the number of strokes delivered per minute can be considerably increased, thereby decreasing the time taken to dig a well.

A further object of the invention is to provide an improved means for connecting the counter-balance beam with the walking beam, the counter-balancing beam being so arranged as to facilitate spudding in as well as drilling in.

A still further object of the invention is to provide an improved well drilling machine of the above character which is durable and efficient in use, one that will be simple and easy to manufacture, and one which can be incorporated with a well machine at a minimum cost.

With these and other objects in view, the invention consists in the novel construction, arrangement and formation of parts, as will be hereinafter more specifically described, claimed and illustrated in the accompanying drawings, forming a part of this specification, in which drawings:

Figure 1 is a side elevation of a drilling machine showing the improved counter-balancing attachment attached thereto, the drilling machine being shown ready for spudding or starting a well hole.

Fig. 2 is a similar view on large scale showing the machine ready for drilling with the temper screw.

Fig. 3 is a top plan view of the drilling machine showing the improved attachment applied thereto, the derrick beam being shown in section.

Fig. 4 is a fragmentary vertical longitudinal section through a portion of the machine showing the type of clutch utilized for connecting and disconnecting the band wheel with the operating shaft.

Fig. 5 is a diametric section through the clutch illustrated in Fig. 4.

Fig. 6 is a fragmentary horizontal longitudinal section through a portion of the machine illustrating the means for bringing the operating wheel for the rope spool into frictional engagement with the band wheel.

Fig. 7 is a detail fragmentary view illustrating the means of connecting one of the pitmen with the balance beam and illustrating the form of pitman utilized.

Referring to the drawings in detail, wherein similar reference characters designate corresponding parts throughout the several views, the letter A indicates a machine embodying the improved counter-balance. The improved machine A includes a wheeled frame B, the power delivering motor C, the band wheel D, the rope spool and actuating means E, the derrick beam F, the drill tool operating means G and the drill tools H.

The wheeled frame B may be of the usual or any preferred construction, and includes the spaced longitudinally extending side beams 5, the transverse brace beams 6, and the front and rear supporting wheel trucks 7 and 8. The frame B may be of the traction type or of any other preferred type.

The motor C as shown is of the internal combustion type and is mounted on the rear end of the frame B and includes the crank shaft 9 on which is mounted the drive pulley 10.

The drive pulley 10 is in direct alinement with the band wheel D which as shown includes a relatively heavy rim 11, which has its outer surface convex for a purpose which will hereinafter be more specifically described. The band wheel D is rotatably mounted upon the countershaft 12 which is mounted in suitable bearing blocks 13 carried by one of the side beams 5 and a longitudinally extending brace beam 14. The inner terminal of the shaft 12 has keyed or otherwise secured thereto the crank arm 15, for a purpose which will hereinafter more fully appear. The rim 11 is connected to the hub 16 of the band wheel D by means of the disk connecting plate 17.

A clutch 18 is utilized for connecting the band wheel D to the counter shaft 12 and this clutch includes an annular friction drum 19 which is secured in any preferred manner to the disk 17. The annular friction drum 19 is adapted to be engaged by the expansible brake band 20 which is carried by an arm 21, that is keyed as at 22 to the counter shaft 12. The free terminals of the brake band 20 are connected together by means of a link and lever connection 23, and this lever and link connection is adapted to have interposed in the path thereof an operating pin 24, for actuating the brake band to move the same in frictional engagement with the brake drum 19. The pin 24 slidably extends through an aperture formed in the disk body 17 and is carried by a grooved sleeve 25, which is slidably mounted on the hub 16 of the band wheel D. The grooved sleeve 25 is engaged by a crank pin 26 which is formed on the crank end 27 of the operating rod 28. This operating rod 28 is mounted in suitable bearings 29 carried by the frame B. It can be seen that by actuating the rod 28 the band wheel D can be connected to or disconnected from the counter-shaft 12 for operating the crank arm 15. The rope spool E and the operating means therefor is provided for permitting the winding up of the rope 30 for the tools H. The spool E is of the usual or any preferred construction and is keyed upon a transversely extending shaft 31 which has its terminals rotatably mounted in suitable bearings 32 carried by the side beams 5 of the wheeled frame B. One terminal of the shaft 31 is extended beyond the crank and has keyed thereto a brake drum 33. The The outer surface of this brake drum 33 is adapted to be engaged by a brake band 34, which is actuated by means of a lever 35. This lever 35 is rotatably mounted upon a pin 36 adjacent to its inner end and intermediate the anchor pins for the brake band. A movable hook 37 is provided for engaging the lever 35 adjacent to its free end for holding the same in an operative position against movement. The periphery of the brake drum 33 also has formed thereon the relatively large spur gear 38, which is engaged by the relatively small spur gear 39. The spur gear wheel 39 is keyed to a shaft 40 which extends in spaced parallel relation to the rope spool shaft 31 and this shaft is connected by means of a ball joint 41 with one side beam 5 of the frame B. The opposite end of the shaft carries an eccentric 42, which is rotatably mounted within an eccentric strap 43, which is bolted to the other side beam 5 of the frame. The shaft 40 has keyed thereto a concaved friction wheel 44 and when the eccentric 42 is operated, the friction wheel will be moved into engagement with the rim 11 of the band wheel D. The band wheel D is connected by means of a belt 45 with the pulley wheel 10. The eccentric 42 is adapted to be operated by means of a lever 46 which is integrally connected thereto.

When it is desired to operate the rope spool E, it is merely necessary to actuate the lever 46 so as to move the eccentric 42 in such a manner that the friction wheel 44 will be moved into engagement with the periphery of the band wheel D.

In drilling, the lever 35 can be operated periodically so as to loosen a few inches of the cable or rope as the hole becomes deeper.

The forward end of the frame B has secured thereto in any preferred manner, the derrick or supporting beam F and this beam may be constructed of any preferred materials and in any preferred manner. As shown the beam F includes the spaced side standards 50, the upper ends of which support the pulley sheave 51 around which the rope 30 is adapted to be trained when the machine is used for spudding and when the tools are to be pulled from the well.

The operating means G for the tools H consist of the walking beam 52, which is mounted intermediate its ends upon a suitable pin 53 carried by bearings mounted upon the upper end of the supporting standard 55. The supporting standard 55 is supported by the frame B of the apparatus.

The outer end of the beam has connected thereto for swinging movement the temper screw 56 which may be of the usual or any preferred construction. The lower end of the temper screw 56 carries the usual clamps

57 for engaging the cable 30 when drilling. The inner end of the walking beam 52 carries for swinging movement the pitman 57. The lower end of the pitman 57 is provided with a bearing for the reception of a wrist pin 58 carried by the lower end of a second pitman 59, which is rockably mounted at its upper end as at 60 to the counter-balancing beam 61. The upper end of the pitman 59 is connected intermediate the ends of the counter-balancing beam 61. The extreme inner end of this beam is connected for swinging movement by means of a shaft 62 to the upstanding vertically disposed beams or standards 63 carried by the frame. A guide pulley 64 is mounted upon the shaft 62 and this guide pulley is adapted to have trained around the same the rope or cable 30. The forward end of the counter-balancing beam 61 has swingably connected thereto the pitman rod 65, which in turn is connected to the wrist pin 66 of the crank arm 15 which is carried by the counter-shaft 12 which is adapted to be operated by the band wheel D. The connecting or pitman rod 59 has its lower end mounted in a suitable guide 67 carried by the outer surface of one of the side beams 5.

The upper surface of the counter-balancing beam 61 at its forward end is also provided with a guide pulley 68 and as can be seen from Fig. 1, the rope 30 is adapted to be trained around this pulley when the machine is used for spudding.

When the machine is used for ordinary drilling, the pitman rods 59 and 57 are connected together as shown in Fig. 2 of the drawings and the temper screw 56 is connected to the cable 30 in the ordinary manner.

In operation of the apparatus, it will be seen that on the up stroke of the pitman 65, the entire weight of the counter-balancing beam 61 is being lifted by the engine, while the tools are on their downward stroke. On the down stroke of the pitman 65, when the tools are being raised, the weight of the counter-balancing beam 61 is utilized for lifting the tools and this prevents the entire load thereof from being assumed by the engine. The provision of this counter-balancing beam 61 places an equal load on the engine at all times, thereby preventing the racing and straining thereof. This also prevents the too quick return of the crank arm 15 which in some instances starts its lifting stroke before the tools have delivered the full force of their stroke. The position of the counter-balancing beam 61 between the tools and the belt 45 eliminates the strain of the uneven load on the belt where it would be if the counter-balance were placed in cumbersome fly wheels on the engine.

When the machine is used for spudding the pitman 57 is disconnected from the pitman 59 and the temper screw clamps 57 are disconnected from the cable 30. The cable 30 is then trained around the pulleys 64, 68 and 51 and it will be seen that upon the upstroke of the pitman 65, the entire weight of the counter-balancing beam 61 is being lifted while the tools H are delivering their impact stroke. This prevents racing the engine and the weight of the beam is utilized for lifting the tools H on their upstroke.

The tools H form no part of the invention and may be constructed in the ordinary or any preferred manner.

When it is desired to stop the operation of the pitman rod 65, it is merely necessary to operate the clutch pin 24 so as to move the same out of the path of the lever and link connection 23 of the brake band 20. This will permit the brake band 20 to move automatically out of engagement with the brake drum 19 of the band wheel D.

From the foregoing description it can be seen that an exceptionally simple and durable attachment has been provided for well drilling apparatus, in which the operating parts thereof are perfectly counter-balanced, so that sudden strain on the engine is entirely eliminated, and so that the force of each stroke of the tool is permitted to be given to the rock.

Changes in details may be made, without departing from the spirit or scope of this invention; but,

I claim:

1. In a drilling machine, a frame, a walking beam carried by the frame, a counterbalance beam carried by the frame, means for connecting the beams together, and means for operating one of the beams.

2. In a drilling machine, a frame, a walking beam, a counterbalance beam, means for detachably connecting the beams together, a motor, and means operatively connecting one of the beams with the motor.

3. In a drilling machine, a frame, a walking beam pivotally secured intermediate its ends to the frame, a counter-balance beam pivotally secured at one end to said frame, means for connecting the beams together, a motor, means for operatively connecting the motor with one of the beams.

4. In a drilling machine, a frame, a walking beam pivotally secured intermediate its ends to the frame, a counter-balance beam secured at one end to said frame, means for detachably and operatively connecting said beams together, means for connecting the work with said beams, a motor, and means operatively connecting the counter-balance beam with the motor.

5. In a drilling machine, a frame, a walking beam secured intermediate its ends to said frame, a counter-balance beam secured at its rear end to said frame, pitman rods carried by said beams and operatively con-

nected together, a motor, means operatively connecting the counter-balance beam adjacent its free end with said motor, and means for connecting the outer end of either of said beams to the work.

6. In a drilling machine, a frame, a walking beam pivotally secured intermediate its ends to said frame, a counter-balance beam pivotally secured adjacent its rear end to said frame, a pitman rod pivotally carried by the counter-balance beam intermediate its ends, a pitman rod carried by the rear end of said walking beam, means pivotally connecting the lower ends of the pitman rods together, a crank shaft, means for operating the crank shaft, a second pitman rod carried by the balance beam and arranged adjacent to its free end, means connecting the last mentioned pitman rod to said crank shaft, a string of tools, and means operatively connecting the string of tools with the outer end of either said walking beam or said counter-balancing beam.

7. In a well digging machine, a frame, a walking beam secured intermediate its ends to said frame, a counter-balancing beam secured at its free end to said frame, a pitman rod carried by the counter-balancing beam intermediate its ends, a pitman rod carried by the rear end of said walking beam, means pivotally securing the lower ends of said pitman rods together, a crank shaft, a band wheel retatably carried by the crank shaft, a motor, means operatively connecting the motor with the band wheel, a clutch for connecting the band wheel with the crank shaft, a pitman rod carried by the counter-balancing beam adjacent to its outer end, means connecting the last mentioned pitman rod with the crank shaft, a string of tools, a cable secured to the string of tools, a derrick beam carried by the frame, a spool for receiving the cable, means for operatively connecting the spool with the band wheel, a brake for said spool, and means for connecting said cable to the free end of said rocking beam or to said counter-balancing beam.

GEORGE S. MINSHALL.