H. H. HAIGHT.

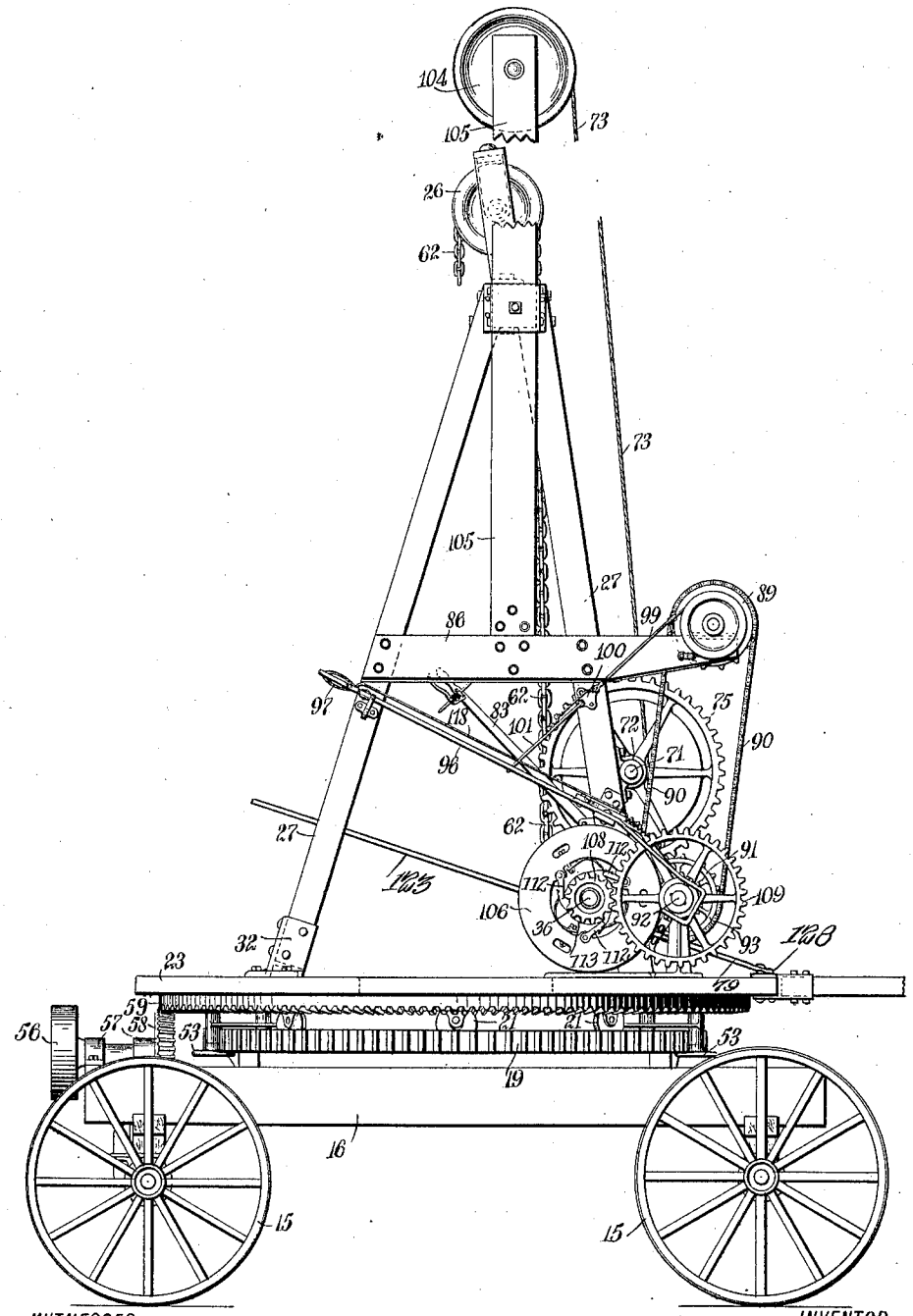
PORTABLE WELL BORING AND DRILLING MACHINE.

APPLICATION FILED MAY 11, 1911.

1,038,877.

Patented Sept. 17, 1912.

5 SHEETS—SHEET 1.



WITNESSES:

Ben Goff

E. M. Murdock

FIG. 1.

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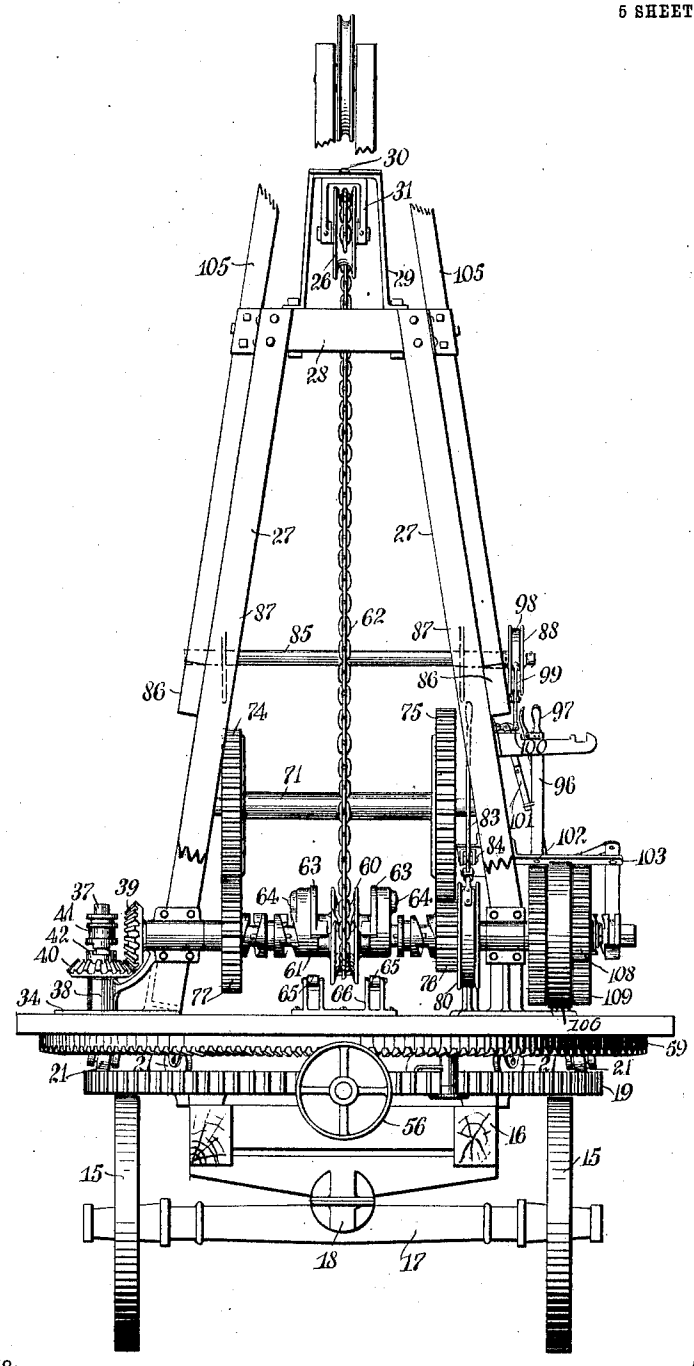

Fig. 2.

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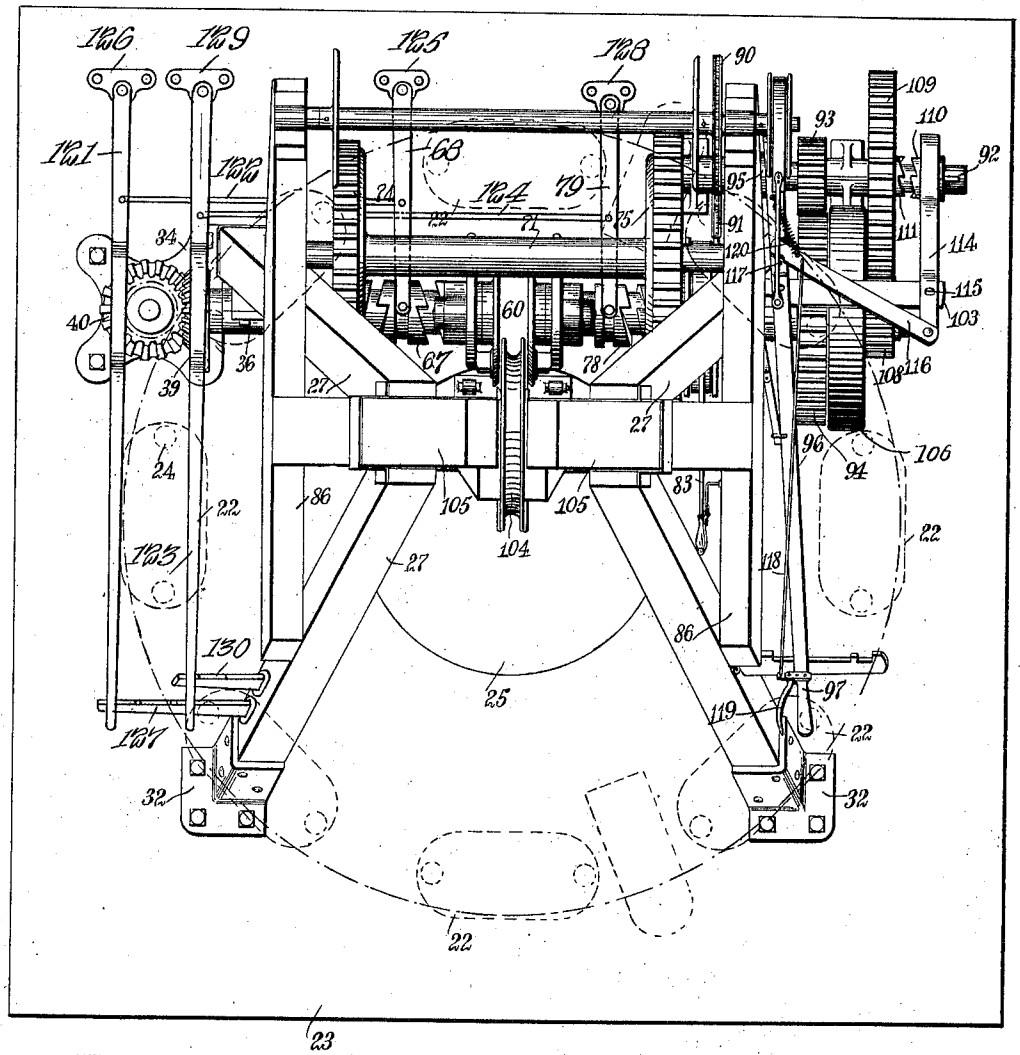

Fig. 3.

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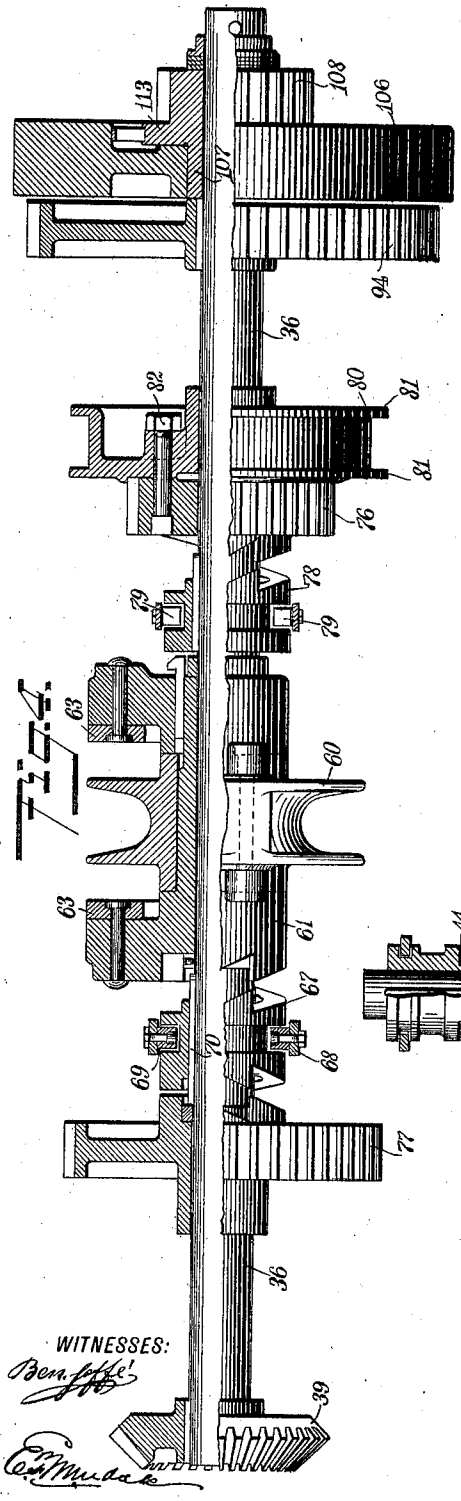

FIG. 4.

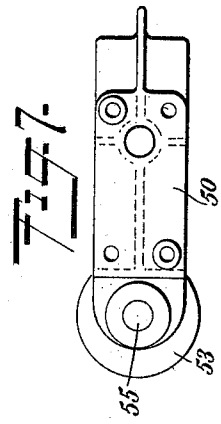

FIG. 7.

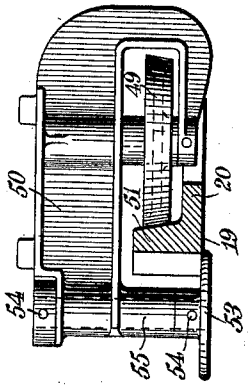

FIG. 8.

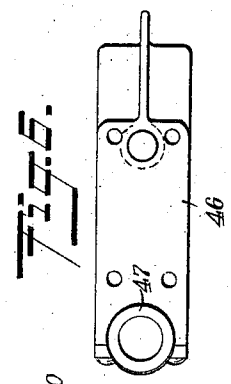

FIG. 6.

FIG. 5.

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5 SHEETS—SHEET 5.

Fig. 9.

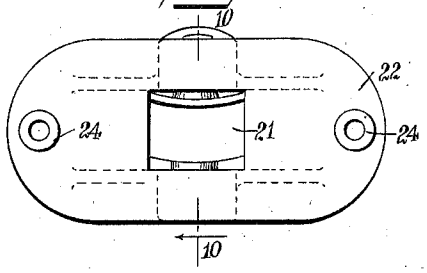
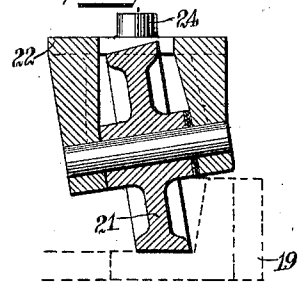


Fig. 10.



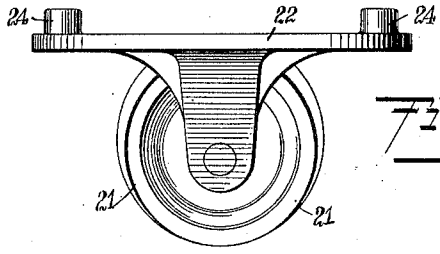


Fig. 11.

Fig. 12.

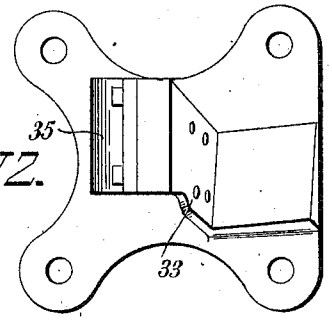


Fig. 14.

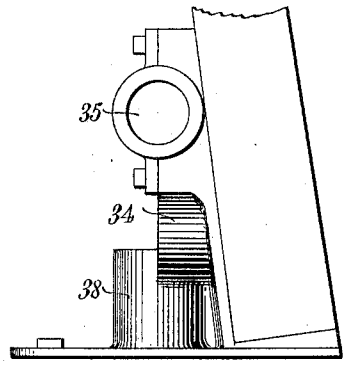
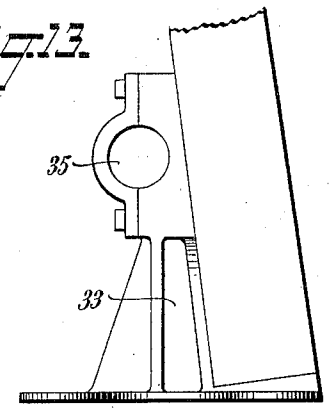


Fig. 13.



WITNESSES:

INVENTOR

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UNITED STATES PATENT OFFICE.

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PORTABLE WELL BORING AND DRILLING MACHINE.

1,038,877. Specification of Letters Patent. Patented Sept. 17, 1912.

Application filed May 11, 1911. Serial No. 626,524.

To all whom it may concern:

Be it known that I, HIRAM H. HAIGHT, a citizen of the United States, and a resident of Clarinda, in the county of Page and State of Iowa, have invented a new and Improved Portable Well Boring and Drilling Machine, of which the following is a full, clear, and exact description.

Among the principal objects which the present invention has in view are: to provide an operating platform for a machine of the character specified which is portable and operable upon its carrying wheels; to provide a mechanism of the character specified which is mounted upon a rotary platform, the rotation of which is concentric with the center of operation or the location of the well; to provide an operating mechanism for a machine of the character specified which is driven from a stationary member with which the operating mechanism is operatively connected; to provide a driving mechanism for a machine of the character specified wherein the speed of the hoisting drum is variable; to provide a driving mechanism for the machine, having a balancing fly wheel connected to the driving shaft by a dragging connection adapted to relieve the shock of a sudden engagement between the shaft and wheel, and to permit the rapid initial acceleration of speed on the driving shaft; and to provide a mechanism the construction whereof is simple, durable and efficient.

One embodiment of the present invention is disclosed in the structure illustrated in the accompanying drawings, in which like characters of reference denote corresponding parts in all the views, and in which—

Figure 1 is a side elevation of a machine constructed and arranged in accordance with the present invention; Fig. 2 is a front elevation of the same, the lower ends of the front struts being cut away to show the driving shaft; Fig. 3 is a plan view of the same; Fig. 4 is a detail view, on an enlarged scale and in plan, and partly in section, showing the driving shaft and devices carried thereby; Fig. 5 is a detail view, on an enlarged scale, partly in section and in side elevation, showing the power transmission mechanism connecting the stationary driving wheel and the driving shaft; Fig. 6 is a detail view in plan, of a stirrup bracket for mounting the transmission mechanism above referred to; Fig. 7 is a detail view in plan, of a stirrup bracket for mounting the guiding devices for the rotary platform; Fig. 8 is a detail view in side elevation, showing the stirrup bracket illustrated in Fig. 7, and in connection therewith the rolling guide wheels and in section the driving wheel; Fig. 9 is a detail view in plan, of the bearing plate of the carrying wheels for the platform; Fig. 10 is a vertical section taken on the line 10—10 in Fig. 9; Fig. 11 is a side elevation of the detail shown in Figs. 9 and 10; Fig. 12 is a detail view in plan, of one of the feet for stepping the struts and forming a bearing for the driving shaft; Fig. 13 is a detail view in side elevation, of the foot shown in Fig. 12; and Fig. 14 is a detail view in side elevation, showing the foot and bearing plate upon which is formed a bearing for the driving shaft and for the transmission shaft.

Upon carrying wheels 15, 15 is supported a wagon frame 16. The wagon frame 16 is pivotally connected with the axle 17 of the front wheels of the vehicle, and is mounted thereon by a king bolt and pivot plates 18 therefor. On the frame 16 is suitably mounted a large gear toothed ring gear wheel 19. The ring gear wheel 19 is constructed from suitable material to form external teeth and having no interior spoke and hub construction. The periphery of the wheel 19 is suitably provided with gear teeth, outwardly flared from the said periphery. The rim of the wheel 19 is formed to provide an interior upturned angle, upon the horizontal portion 20 whereof supporting wheels 21, 21 are arranged to track. The wheels 21, 21 are suitably mounted in caster plates 22, 22. The plates 22, 22, as shown in the accompanying drawings, are eight in number, and distributed as shown in Fig. 3 of the drawings, and in dotted lines therein. The plates 22, 22 are fixedly secured upon a platform 23, being bolted thereto, and provided for that purpose with perforated bosses 24, 24. Suitable bolts are passed through the plates 22 and the platform 23 to anchor the said plates fixedly in position on the said plat-

form. The platform is preferably rectilinear in shape, as shown in Fig. 3 of the drawings, and is provided with a central opening 25, which is formed for the run of the tools for boring, drilling and cleaning, and for the operating gear connected therewith. The center of the opening 25 is concentric with the center of the wheel 19. Directly above this center, and in line therewith, is disposed a pulley 26. The forward edge of the pulley 26, and of the groove therein, is vertically disposed with reference to the center of the wheel 19 and of the opening 25.

The pulley 26 is suspended in the position above stated upon a short derrick formed by struts 27, 27, which are disposed around the opening 25, and converged at the upper end upon a ridge piece 28. Upon the ridge piece 28, and bolted thereto, is mounted a metal yoke 29, suspended from the top thereof, and pivotally connected by means of a pivot pin 30 therewith is a swivel yoke 31, in the ends whereof are formed bearings for the shaft of the pulley 26.

The struts 27, 27 are four in number, and are mounted upon the platform 23 by being stepped in and bolted to metal sockets 32, 32, 33 and 34. The lower ends of the struts 27, 27 are fastened permanently to the sockets by being bolted thereto. The sockets 33 and 34 form bearings 35, 35 for the main driving shaft 36, whereby the drilling operation is conducted from the platform 23. The shaft 36 is rotated in unison with, and by reason of, the rotation of the platform 23. This is accomplished by means of a short vertical transmission shaft 37, to support which the socket 34 is further provided, erected on the same base plate, with a vertically disposed bearing boss 38, from which a suitable bearing is vertically extended. The shafts 36 and 37 are operatively connected by bevel gears 39 and 40. These gears are preferably the same diameter, permitting thereby the same rate of rotation of the shaft 36 as received by the shaft 37. The gear 40 is supported in vertical disposition by the boss 38, and is rotatively mounted upon the shaft 37. Mounted on the said shaft 37 is a clutch 41, slidably mounted on the said shaft and on a spline or feather provided therefor. When the clutch 41 is lowered so that the truncated teeth 42 formed on the hub of the wheel 40 are engaged by the corresponding teeth on the clutch 41, the shaft 36 is driven in unison with the shaft 37.

The shaft 37 is rotated by reason of its engagement with the teeth formed on the periphery of the master wheel 19. This engagement is formed by a spur gear 43 fixedly mounted on the lower end of the shaft 37, and where the same extends through a bearing 44 formed in the outer end of the stirrup bearing 45. The stirrup bearing 45 is provided with a head plate 46, which is bolted securely in position upon the platform 23, and is provided with a recess 47 to form a bearing for the lower edge of a supporting collar 48 fixedly mounted on the shaft 37, as seen in Figs. 5 and 6 of the drawings. The engagement between the teeth of the wheel 19 and the wheel 43 is permanent, and whenever the platform 23 is rotated the shaft 37 is rotated. The disproportion of the diameters of the wheels 19 and 43 is great, thereby imparting a greatly multiplied number of revolutions to the shaft 37 for each rotation of the platform 23.

The platform 23 is guided in its rotation, and held concentric with the wheel 19, by means of guide wheels 49, 49. The guide wheels 49, 49 are mounted in the stirrup bearings 45 and 50, a yoke end being provided in each of the stirrup bearings to support the lower end of the shaft on which the guide wheels 49 are mounted. The wheels 49, 49 are disposed to bear against the surface of a vertical section 51, forming the rim of the wheel 19. In the wheel 43 there is provided a fin or web 52 extending between each of the teeth of the wheel, and forming an annular flange or rim which extends below the teeth of the wheel 19 when the teeth on the wheel 43 are engaged therewith. This flange or fin 52 prevents the rise of the platform, serving as an anchor upon the wheel 19. In each of the bearings 50 an idler disk 53 is provided, being fixedly connected by attachment pins 54, 54 to a spindle 55. The disks 53, 53 extend under the rim of the wheel 19, and prevent the rise of the stirrup bearings, and thereby of the platform 23.

The platform 23 may be rotated by any suitable means, such as, for instance, the ordinary horse hitched sweep usual in such devices as a horse winding windlass. The preferred method, however, of rotating the platform 23 is by the employment of a power driven mechanism, which is connected with the platform 23 through a driven pulley 56, which is mounted fixedly upon a shaft set in bearings 57, 57, stationarily mounted on the frame 16, and which shaft is provided at the inner end with a bevel gear 58. The bevel of the gear 58 is pitched to coincide with the pitch of the gear teeth formed on a crown wheel 59, mounted upon the under face of the platform 23. The crown wheel 59 is of any suitable size, and is regulated in effect to determine the speed of rotation of the platfrom 23. Any suitable form of mechanically power driven machine may be belt connected with the pulley 56.

As above described it is seen that the platform 23 is portable on the wheels 15, 15, and carries a superstructure in the shape of the derrick formed by the struts 27, 27,

and that, connected with the said struts is the driving shaft 36, with transmission mechanism extended from the wheel 19, stationarily mounted upon the frame 16, to the said shaft 36, in such manner as to receive the rotation from the engagement of the transmission mechanism with the said wheel 19. The boring and lifting operations necessary to the driving of a well are controlled and manipulated from the driving shaft 36. The operations, broadly stated, for which this machine is designed, consist in boring and drilling holes, and in cleaning or clearing the same. For the purpose of drilling, the shaft 36 is provided with a spudding pulley 60 for the jerk line, which pulley is automatically engaged and disengaged with the shaft 36 and the housings connected therewith. This pulley in its details of construction is set forth in Letters Patent of the United States issued July 25, 1911, and numbered 999,026, and to which reference is here made. Suffice it to state that the pulley 60 is mounted rotatively in a fixed housing block 61, which housing block is rotatively mounted upon the shaft 36. A chain constitutes the jerk line 62, which is wound upon the pulley 60, and reeved over the pulley 26 and connected at the free end with the drill rods or hoisting cable connected with the boring or cleaning devices employed in the operation of constructing the well. The engagement between the pulley 60 and the housing 61 is in the form of a clutch, the arms 63, 63 being pivotally mounted at 64, 64 in the housing 61, and the ends of the said arms adapted to ride over releasing rollers 65, 65, which are stationarily mounted upon standards 66 on the platform 23, and which rollers operate to lift the arms 63, 63 out of engagement with the said pulley 60. The housing 61 is connected to operate with the shaft 36 by a clutch 67, the one face of which is toothed to engage the hub of the said housing, while the opposite face is similarly formed to engage the hub of a spur gear wheel for operating the lifting drum of the machine. The clutch 67 is operated by a lever 68, the collar pins 69 whereof are seated in the clutch collar, as shown in Fig. 4 of the drawings. The clutch 67 is mounted to slide on the shaft 36 by means of a key 70. When in the operation of drilling, and after the bits and connecting rods have been assembled, the shaft 36, continuing steadily to revolve, the jerk line 62 is rapidly lifted and dropped, permitting the weight of the tool to perform the operation of drilling.

To hoist the drilling tools there is provided a winding drum 71. The drum 71 is mounted in bearings 72 formed in the side of the struts 27, 27. A cable 73 is wound on the said drum 71, the free end whereof is attached to the tools used in drilling. The drum 71 is provided with heavy spur wheels 74 and 75, the latter being of a greater diameter than the former, and meshed with a smaller pinion 76 rotatively mounted on the shaft 36. The small wheel 74 is meshed with a large wheel 77 rotatively mounted on the shaft 36. The engagement between the shaft 36 and the wheel 76 is formed by a clutch 78, a lever 79 being provided for shifting the said clutch so that the teeth thereof engage the teeth formed on the hub or face of the wheel 76. The engagement between the shaft 36 and the gear 77 is formed by the clutch 67, which is shaped as shown in Fig. 4 of the drawings, and is operated by the clutch lever 68. The clutch levers 68 and 79 are pivotally mounted on the platform 23.

It is by the manipulation of the levers 68 and 79 that the transmission of rotation from the shaft 36 to the drum 71 is increased or diminished in accordance as the clutch 67 is engaged with the wheel 77, or the clutch 78 is engaged with the wheel 76, respectively.

The purpose in providing the gearing shown for producing variable speeds in the drum 71, is that it is found that during the preliminary step of lifting the tools, particularly when the same are heavy, it is desired that the lifting action of the drum 71 be slow. When the load is started and well under way the clutch 67 may then be moved to engage the wheel 77, when the rotation of the drum will be materially increased. By thus manipulating the mechanism herein described, the work of raising the tools is facilitated.

In connection with the operation of the drum there is employed a band brake wheel 80. The brake wheel 80 is provided with suitable flanges 81, 81 to hold the band on the shoe of the wheel. The wheel 80 is held in fixed relation with the pinion 76. The pinion 76 is at all times in mesh with the wheel 75, and the control of the brake wheel 80 at all times controls the rotation of the drum 71. The band on the said brake is tightened or loosened by a lever 83, which is pivoted in a suitable bracket 84 mounted on the strut 27.

A drum 85 is provided to operate the pump for removing water, sand, drilling cuttings, etc., from the well. The shaft of the said drum is mounted in bearings provided on the ends of bracket beams 86, 86. The drum 85 is provided with side disks 87, 87 and with a drum 88. Also mounted on the said shaft of the said drum is a sprocket wheel 89 rotatably connected by means of a sprocket chain 90 with a sprocket wheel 91 formed on a shaft 92. The shaft 92 is provided with a small pinion 93, fixedly attached to the said shaft, and tooth-engaged

with a large gear wheel 94, which gear wheel is fixedly mounted upon the shaft 36 to be constantly rotated thereby. The ratio between the wheel 94 and the pinion 93, is such that the rotation of the shaft 92 is multiplied above the rotation of the shaft 36. The sprocket wheel 91 is loosely mounted on the shaft 92, and is rotatively connected therewith by means of a clutch 95. The clutch 95 is operated by a lever 96, the handle 97 whereof is extended to the operating station for the mechanic in charge of the machine. With the operation of the lever 96 to seat or release the clutch 95, the brake band 98 is eased or tightened on the drum 88. This is accomplished by a pull rod 99, the end whereof is pivoted on a rocking arm 100. The rocking arm 100 is connected by means of links 101 with the lever 96. The arrangement of the lever 96, which is pivoted at 102 on a framing bar 103, is such that when the lever is thrown to seat the clutch 95 upon the sprocket wheel 91, the brake band 98 is released from holding engagement with the drum 88, and when the clutch 95 is released from engagement with the sprocket 91 the brake band is tightened upon the drum 88. In this manner, and by reason of the construction described, the pump is maintained in its elevated position when and as arrested by discontinuing the rotation of the drum 85, which is accomplished by releasing the clutch 95.

The cable 73 is used on the drum 71. The cable 73 is reeved over a pulley 104, pivotally mounted in the upper ends of mast framing members 105, 105. The forward edge of the pulley is alined vertically with the pulley 26.

Loosely mounted on the shaft 36 is a weighted fly wheel 106. The fly wheel 106 is loosely mounted on the hub 107 of a gear pinion 108 as best seen in Fig. 4 of the drawings. The pinion 108 is rotatively mounted on the shaft 36, and is tooth-engaged by a large gear wheel 109, which is loosely mounted on the shaft 92. The gear wheel 109 is operatively engaged with the shaft 92, when a clutch 110, which is keyed to the shaft 92, is moved to engage the clutch hub 111 formed on the wheel 109.

When the wheel 109 is rotatively engaged with the shaft 92 the result is that through the wheel 94, the pinion 93, the wheel 109 and the pinion 108, a greatly multiplied speed is imparted to the last-mentioned pinion. A series of pivoted dogs 112 are interposed between the inner surfaces of the periphery of the fly wheel 106 and the notched outer surface of a collar 113 formed on the pinion 108.

To throw the clutch 110 into and out of engagement, the same is provided with a lever 114, which is pivoted at 115 upon the framing bar 103. The end of the lever 114 is connected to the lever 96 by a link bar 116, and by a pin set up in the lever 96. The loose end of the link bar 116 is drawn into engagement with a pin 117 by a connecting rod 118, to which a hand lever 119 is pivotally attached. The lever 119 is pivotally mounted on the handle 97 of the lever 96. A spiral spring 120 is provided to retract the free end of the link bar 116 to maintain the said bar normally out of engagement with the pin, whereby the lever 96 can be operated as above described without operating the clutch 110. When, however, it is desired to operate the clutch 110, this is accomplished by compressing the hand lever 119 upon the handle 97, which raises the connecting rod 118 and the free end of the bar 116 into engagement with the pin 117. In this engaged relation of the bar 116, when now the lever 96 is moved to the right the clutch 110 is thrown into engagement with the wheel 109.

In the operation of the machine, it will be seen that the prime motive power in immediate connection with the mechanism herein described is the shafts 36 and 37 and the master wheel 19. The means for rotating the platform 23 may be varied. It will be observed further that the mechanism for controlling the operating mechanism is located upon and operable from the said platform. Further, it will be noticed that the mechanism whereby the tools are raised has a double or variable speed, fully under the control of the operator. It will also be seen that the operation of the tool raising mechanism can be arrested at any time without permitting the tools to drop. Further, that by the manipulation of the brake upon the driving shaft, the drum for raising the tools may be controlled to drop the same quietly and easily into operative position. It will also be seen that the mechanism for operating the pump for clearing and boring is steady and rapid.

The levers 68 and 79 above referred to as controlling the clutches 67 and 78 respectively are manually controlled by means of levers 121 and 123 respectively. The levers 121 and 123 are connected with levers 68 and 79 by means of connecting rods 122 and 124, as shown best in Fig. 3 of the drawings. The levers 121 and 123 are held in adjusted position by means of toothed brackets 127 and 130. The levers 68 and 79 are mounted in bracket bearings 125 and 128, while the levers 121 and 123 are mounted in bracket bearings 126 and 129.

It will be understood that the arrangement of the controlling levers for the clutches may be varied. Any suitable method of shifting said clutches may be adopted.

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

1. In a portable well drilling machine, a revolving platform; a driving shaft mounted on said platform; a stationary member operatively engaged to rotate said shaft in harmony with the rotation of said revolving platform; a weighted fly-wheel mounted on said shaft; a power transmission and speed-multiplying mechanism operatively connecting said fly-wheel and said shaft, embodying a large gear wheel fixedly mounted on said shaft; and a manually-operative clutch mechanism for initiating and discontinuing the operation of said speed-multiplying mechanism.

2. In a portable well-drilling machine, a revoluble platform; a driving shaft mounted on said platform, to be revolved about the center of said platform; a stationary member operatively engaging the end of said shaft to rotate said shaft in harmony with the movement of the revolving platform; a housing loosely mounted on said shaft to form a bearing for a spudding pulley, and having clutch ends; a manually operative clutch slidably mounted on said shaft to engage said housing, to rotate the same with said shaft; a plurality of engaging devices for intermittently connecting said pulley and said housing in fixed relation; and a plurality of interference members mounted in the path of said devices to disengage the same from said pulley.

3. In a portable well drilling machine, a revolving platform; a driving shaft mounted on said platform to revolve about the center thereof; a stationary member operatively engaging the end of said shaft to rotate said shaft in harmony with the movement of said platform; a winding drum disposed in parallel relation to said shaft; a plurality of variable-speed-transmission gear wheels, rotatively mounted on said drive shaft and operatively engaging the winding drum; and a plurality of clutches mounted on said driving shaft to engage the said gear wheels mounted thereon, to rotate the same with said shaft.

4. In a portable drilling machine, a revolving platform, a driving shaft mounted on said platform to revolve therewith about the center of said platform; a stationary member operatively engaging one end of said shaft to rotate the same in harmony with the movement of said platform; a winding drum mounted on said platform, in parallel relation with said shaft, and having fixedly attached thereto driving gears of varied diameter; a plurality of power-transmission gear wheels loosely mounted on said driving shaft, in engaged relation with said gears on said drum; a plurality of clutches mounted on said driving gear to selectively engage the said gear wheels mounted thereon; and a manually operative brake mechanism fixedly connected to either of said gear wheels on said driving shaft, engaging the gear wheels on said drum.

5. In a portable well drilling machine, a revolving platform; a driving shaft mounted on said platform to revolve therewith about the center thereof; a stationary member operatively connected with said shaft to rotate the same as it is revolved about the center of said platform; a spudding wheel loosely mounted on said shaft, adapted to intermittently elevate and release a suitable cable; a hoisting drum mounted on said platform in parallel relation to said driving shaft; a plurality of power transmission and speed-varying mechanisms connecting said driving shaft and said winding drum; and manually operative clutches for engaging said power-transmission mechanisms alternately, one of said clutch mechanisms operating to engage and release said spudding wheel and one of said speed-varying mechanisms alternately.

6. In a portable well drilling machine, a revolving platform; a rotary shaft mounted on said platform to be rotated therewith about the center thereof; a stationary member operatively connected with said shaft to rotate the same as said shaft is revolved about the center of said platform; a spudding mechanism mounted on said shaft, to operate to alternately engage and release a spudding cable; a hoisting drum mounted on said platform in parallel relation with said driving shaft; two gear wheels of unequal diameter fixedly mounted on said drum; a plurality of transmission gear wheels on said shaft of unequal diameter corresponding with said wheels on said drum, the combined diameters of each pair of gear wheels being equal; and manually operative clutches for alternately connecting the said gear wheels with said driving shaft, and one of said clutches being arranged to engage the spudding mechanism.

7. In a portable well drilling machine, a revolving platform; a rotary shaft mounted on said platform to be rotated therewith about the center thereof; a stationary member operatively connected to rotate said shaft as said shaft is revolved about the center of said platform; a spudding mechanism mounted on said shaft, to operate to alternately engage and release a spudding cable, a hoisting drum mounted on said platform in parallel relation with said driving shaft, two gear wheels of unequal diameter fixedly mounted on said drum; a plurality of transmission gear wheels on said shaft of unequal diameter corresponding with said wheels on said drum, the combined

diameters of each pair of gear wheels being equal; manually operative clutches for alternately connecting the said gear wheels with said driving shaft, and one of said clutches being arranged to engage the spudding mechanism; and a manually operated brake mechanism, embodying a brake drum fixedly mounted on the smaller of said transmission gear wheels and a band to engage said drum when the clutches are removed from said transmission wheels.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HIRAM H. HAIGHT.

Witnesses:
H. G. SIVERSON,
J. E. RORMAN.