B. D. TILLINGHAST & H. B. PORTERFIELD.

OPERATING AND REVERSING MECHANISM.

APPLICATION FILED MAY 27, 1909.

991,809.

Patented May 9, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

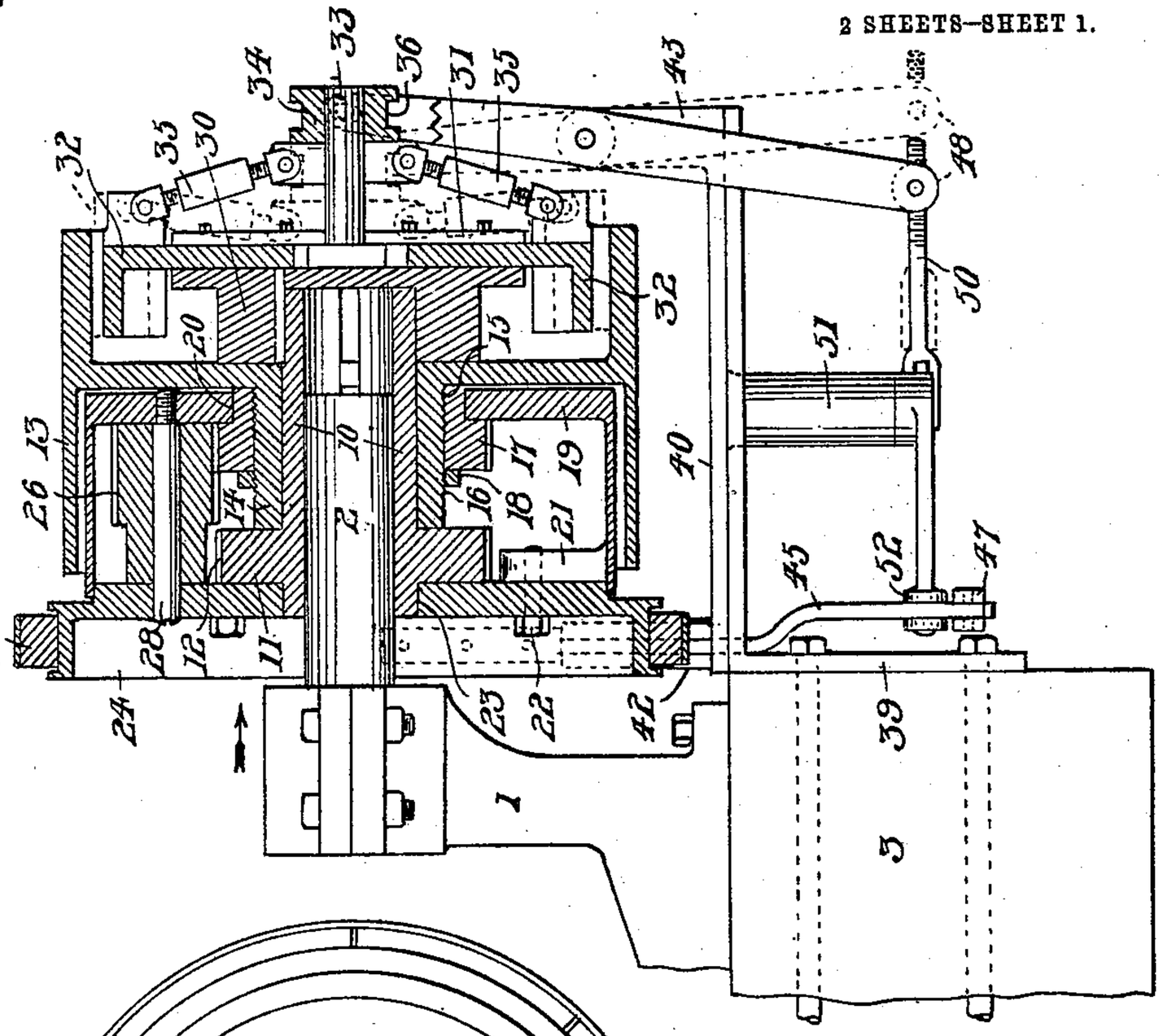
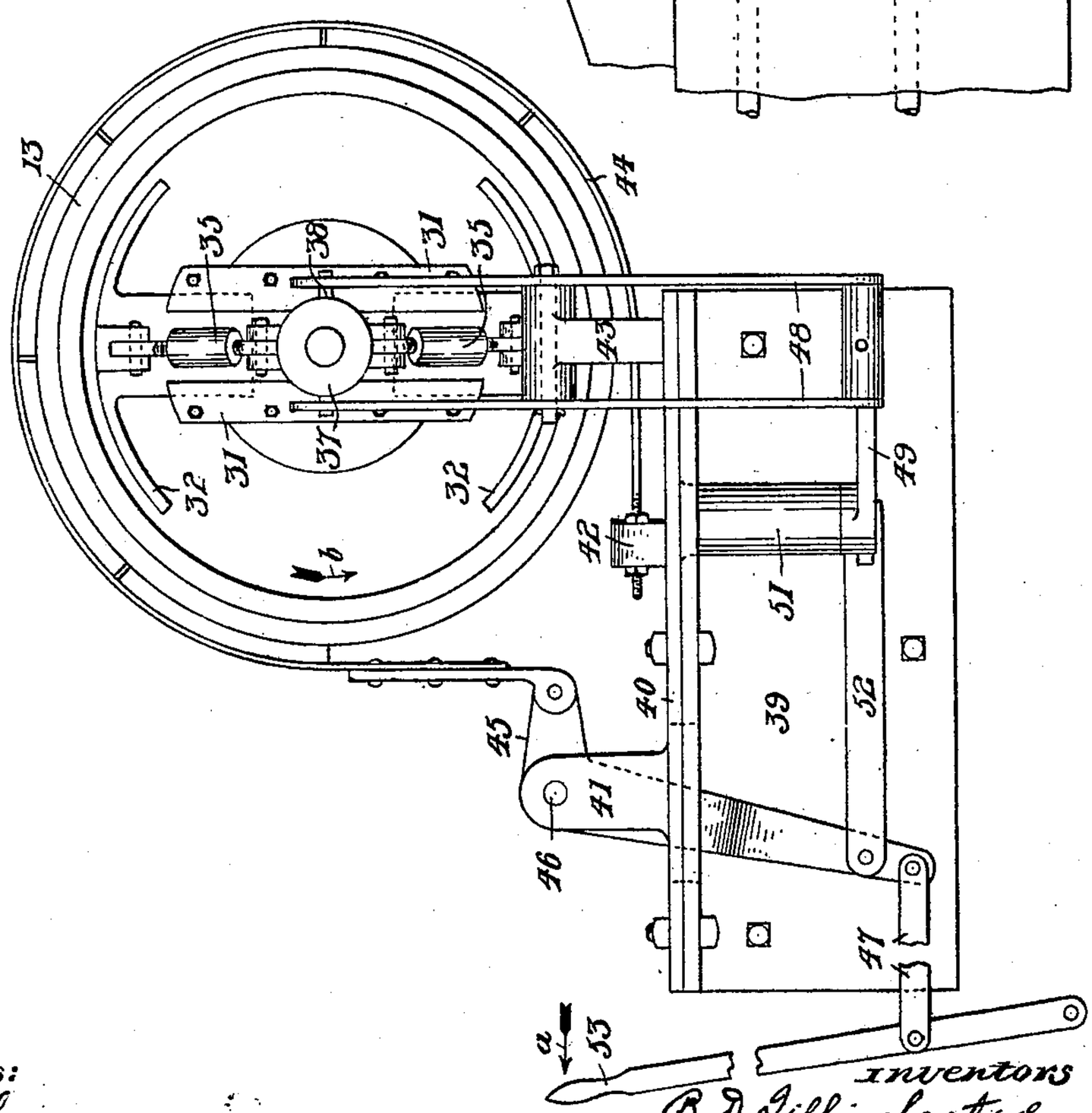


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 4.

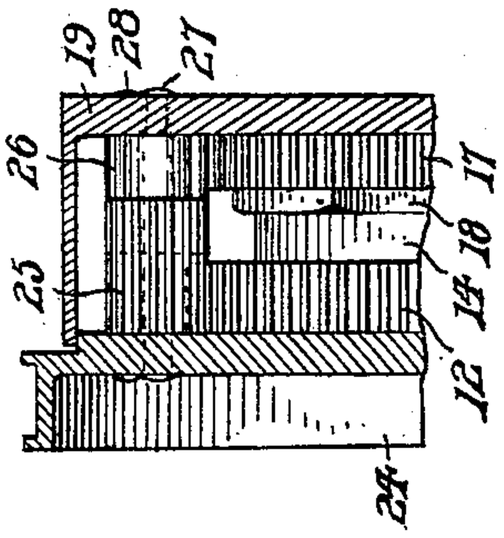


Fig. 6.

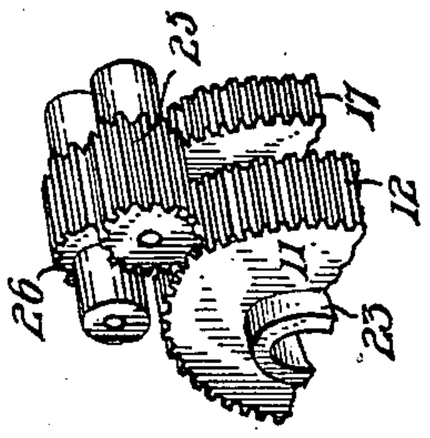
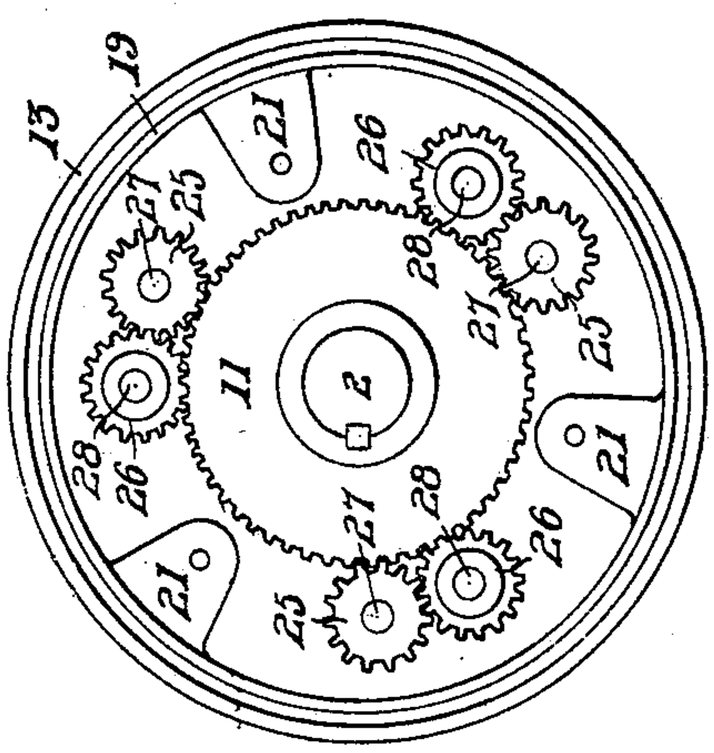


Fig. 3.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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OPERATING AND REVERSING MECHANISM.

991,809. Specification of Letters Patent. Patented May 9, 1911.

Application filed May 27, 1909. Serial No. 498,733.

To all whom it may concern:

Be it known that we, BARRETT D. TILLINGHAST and HARRY B. PORTERFIELD, residents of McDonald, in the county of Washington and State of Pennsylvania, have invented certain new and useful Improvements in Operating and Reversing Mechanism for Well-Drilling Apparatus, of which the following is a specification.

Our invention relates to improvements in apparatus employed in connection with drilling and operating oil and gas wells.

An object of our invention is to provide new and improved means for operating a reversing-mechanism at a distance from said mechanism, as for example, the derrick floor of an oil or gas-well.

In the accompanying drawings, which illustrate an application of our invention, Figure 1, is a part elevational view of a portion of an engine mounted on a foundation and a sectional view of the reversing-clutch-pulley-mechanism applied to the drive-shaft thereof; Fig. 2, an end elevational view of same; Fig. 3, a detail plan of a portion of the clutch operating mechanism; Fig. 4, a detail sectional view of gear-casing and gears therein; Fig. 5, an end-view of a portion of the gearing looking in the direction shown by the arrow Fig. 1, with the brake-drum removed, and Fig. 6, a detail perspective view of gearing.

Referring to the drawings, 1 designates a portion of the bearing-support for the main-drive-shaft 2 of an engine. As shown the engine is mounted on a foundation 3.

Heretofore for the purpose of effecting the operation of reversing the driven mechanism of the drilling means it has been the custom to employ in connection with the shaft of an explosive engine an out-board bearing extended from the engine shaft on which the reversing mechanism is mounted and to provide a separate foundation for this bearing and to mount the actuating mechanism for the reversing mechanism upon this additional foundation or upon another foundation separate from the engine foundation. This arrangement entails considerable expense in the construction of the additional foundations and in some cases, particularly where the engine is already installed and is to be provided with a reversing mechanism, necessitates the shifting of the engine foundation to accord with the proper alinement between the driving mechanism and the drilling parts to be driven. Such arrangements thus not only entail considerable expense in installation but also in operation result in injury or undue wear on the parts owing to the distinct vibrations imparted to the engine and to the connected parts by reason of their support upon separate foundations. With our invention the trouble and expense of providing an out-board bearing is obviated and the device is adapted to be applied to an engine already installed without shifting the engine or any of the connected parts and any injury due to non-uniformly vibrating associated parts is avoided.

To these ends our invention comprises, generally stated, a reversing mechanism for the driven parts adapted to be mounted directly on the end of the drive shaft of the engine, and associated with such an arrangement of the reversing mechanism a support for the actuating means of the reversing mechanism mounted directly on the engine foundation; and it also comprises the particular construction of such support and of the actuating means.

As shown, the main-shaft 2 projects only a short distance from its end bearing support 1 and our reversing-mechanism is mounted directly thereon. By means of our construction the reversing-clutch-mechanism may be applied to the drive-shaft of the engine without the necessity of extending the shaft either by substituting a longer shaft or by inserting a second shaft in alinement with the drive-shaft. All that is necessary to apply our mechanism is the removal of the pulley and the substitution therefor of our combined pulley and reversing-clutch-mechanism.

Mounted on and secured to the end of shaft 2 is an elongated hub or sleeve 10 having a collar or ring 11 formed integral therewith. Ring 11 is formed with teeth 12 and constitutes a gear-wheel.

Rotatably mounted on hub or sleeve 10 and adapted to rotate in either direction, is a belt-pulley 13, the hub 14 of which is

threaded as shown at 15 and 16. Mounted on hub 14 and being internally threaded to engage the thread 15 is a spur-gear 17.

18 designates a lock-nut formed with an internal right-hand thread engaging the threads 16 of the hub 14 and adapted to be forced against the spur-gear 17.

19 designates an annular gear-case which is mounted to freely rotate on a bearing 20 of spur-gear 17. Gear-case 19 is formed with a plurality of apertured lugs 21, adapted to receive threaded bolts 22.

Located in advance of the gear-case 19 and carried on a bearing 23 of the hub 10 is a brake-drum 24. Drum 24 is secured to the gear-case by means of the bolts 22 and is designed to be rotated therewith.

Within the gear-casing and arranged in pairs as particularly shown by Fig. 5, we employ two sets of pinions, one set comprising a series of pinions 25, and the other a series 26. Pinions 25 are carried on pins or small shafts 27 and pinions 26 on small shafts 28; said shafts are passed through the drum 24 and extend therefrom to a wall of the gear-casing. As shown, the pinion 25 of each pair meshes with pinion 26 of each pair, and also with the teeth 12 of ring or collar 11 formed integral with hub 10, and the pinions 26 with the spur-gear 17. In order to enable the respective pinions 25 to mesh with the pinions 26, the teeth of each are extended a sufficient distance beyond their respective spur-gears, but not sufficiently far as to interfere with the other spur-gears.

Carried on and secured to the outer end of hub or sleeve 10 is a head or cap 30 and slidable thereon and held between strips 31 are friction-shoes 32. Projecting outwardly from the cap and secured thereto by the strips 31 is a shaft or pin 33 and fitted to slide on said shaft 33 is a spool or sleeve 34, connected with the shoes by means of adjusting-links 35. Said spool is grooved as shown at 36 to receive a yoke 37 having trunnions 38. The yoke is loosely mounted on the spool so as not to revolve with the spool.

The mechanism for operating the reversing-clutch-pulley mechanism as shown and as preferred comprises an angle-plate 39 attached to the foundation 3, or it may be secured to the engine frame below its drive-shaft. Supported by plate 39 and adjustable thereon in a direction parallel to the center line of the main drive-shaft of the engine is a second plate 40. Plate 40 is provided with upwardly extending lugs or projections 41, 42 and 43. To the intermediate lug 42 one end of a band-brake 44 is secured, the other end of the band being attached to one arm of a bell-crank lever 45, which lever in turn is pivoted at 46 to the lugs 41. Bell-crank-lever 45 is arranged to operate in a vertical plane at right angles with the axis of the engine driving-shaft and has its long arm projecting downwardly through the plates 39 and 40 and connected with an actuating rod 47.

48 designates levers secured at their upper ends to the trunnions 38 of yoke 37 and pivoted to lug 43. The lower ends of said levers are joined to an arm of a bell-crank-lever 49 by means of link 50. Bell-crank-lever 49 is pivoted to a boss 51 projecting downwardly from the adjustable plate 40 and is designed to operate in a plane parallel to the axis of the main-shaft of the engine. The other arm of the bell-crank-lever 49 is connected with the long arm of bell-crank-lever 45 by means of a connecting-link 52.

Actuating rod 47 may be extended to any desired location, preferably to the floor of an oil-well derrick, and is then connected with an operating lever 53.

The object of the reversing-clutch-pulley-mechanism is of course to reverse the motion of the pulley 13, without regard to the continuously rotating drive-shaft of the engine, which always rotates in the same direction.

As above explained, the bell-crank-lever 45 is designed to move or operate in a plane at right angles with the plane of the axis of the driving-shaft and the bell-crank-lever 49 in a plane parallel to the axis of said shaft. It should also be understood that a movement of the actuating-rod 47 in the direction indicated by arrow *a*, Fig. 2, will draw the brake-band 44 into contact with its drum 24, and following the movement of the clutch-operating-mechanism the spool 34 will, by this same movement, be carried forward into the position shown in full lines on Fig. 1, with the friction-shoes 32 free of the pulley 13. Further, when the actuating-rod 47 is moved in an opposite direction from that just mentioned, the brake-band 44 will be released from contact with its drum and simultaneously therewith the spool or sleeve 34 is moved in toward cap 30, thereby causing the friction-shoes to engage the pulley.

With the above generally stated operation of some of the main parts, it is believed that the following description will be readily understood.

Assuming that the main-shaft of the engine is rotating in the direction of the arrow *b*, Fig. 2, and that the lower or long arm of bell-crank-lever 45 is placed in a vertical or neutral position, both the brake-band 44 and friction-shoes 32 will be out of contact with their respective friction surfaces. Main-shaft 2 in its rotation carries with it the hub or sleeve 10 and its spur-gear together with the cap 30 and friction-shoes 32. Assuming that the driving-belt is in

position on pulley 13, there will be, while the parts above described are in the positions stated, no motion imparted to the belt so long as the bell-crank-lever 45 remains in its neutral position. If it is desired to have the driving-pulley 13 rotate in the same direction as shaft 2, the actuating-rod 47 is moved in a direction opposite to that indicated by arrow *a*, thus locking the friction-shoes 32 to the friction-surface of the inner side of the rim of pulley 13, thereby causing the pulley to rotate in the desired direction. To drive the pulley 13 in a direction the reverse of that of driving-shaft 2, the actuating-rod 47 is moved in the direction of the arrow *a*, which movement releases friction-shoes 32 and at the same time causes brake-band 44 to tightly embrace the drum 24 with sufficient force to prevent the drum and its attached gear-casing 19 from rotating. The forward motion of the sleeve 10 with its gear will impart motion to the pinions 25, causing said pinions to rotate in a direction opposite to that of the gear of sleeve 10. The pinions 25, which mesh with pinions 26, will rotate said pinions in a direction opposite to the rotation of pinions 25, or in the same direction as that of the gear on sleeve 10, and pinions 26, which mesh with the spur-gear 17, in turn rotate said spur-gear 17 in a direction opposite to the rotation of said pinions 26, hence in a direction opposite to that of the spur-gear or sleeve 10. Sleeve 10, being attached to drive-shaft 2, rotates therewith, and spur-gear 17, being attached to driven pulley 13, and their respective motions of rotation being in opposite directions, it follows that the driven pulley 13 will rotate in a direction opposite from the driving-shaft 2, or in a reverse direction from its first direction of rotation.

What we claim is—

1. In operating and reversing mechanism for a well-drilling apparatus, in combination with an explosive engine and a foundation therefor, a reversing mechanism mounted solely on one end of the driving shaft of the engine, a drive pulley surrounding the reversing mechanism and shaft, controlling means for said reversing mechanism supported by said engine foundation, an operating device for said controlling means located at a distance from said engine foundation, and connecting means between said operating device and said controlling means, substantially as described.

2. In operating and reversing mechanism for a well-drilling apparatus, the combination with an explosive engine and a foundation therefor, and the driving shaft of said engine, and a driven pulley surrounding said shaft, of a reversing mechanism mounted solely on one end of the driving shaft of the engine between the shaft and the driven pulley, controlling means for the reversing mechanism and a support for said actuating means comprising a plate secured to the foundation, an operating device for said controlling means located at a distance from said foundation, and connecting means between said operating device and said controlling means, substantially as described.

3. In operating and reversing mechanism for a well-drilling apparatus, the combination with an explosive engine and a foundation therefor, of a reversing mechanism, a driving shaft, controlling mechanism for said reversing mechanism, a supporting plate attached to said engine foundation, a second plate secured to said supporting plate, and adjustable thereon parallel to the axis of the shaft, said controlling means being mounted upon said adjustable plate, and an operating device for the controlling means, substantially as described.

4. In operating and reversing mechanism for a well-drilling apparatus, the combination with an explosive engine and a foundation therefor, a driving shaft, of a reversing mechanism mounted solely on one end of the driving shaft of the engine, driven mechanism, a supporting plate secured to the foundation, an adjustable plate on the supporting plate, a controlling mechanism for the reversing mechanism comprising a bell crank lever arranged to operate in a vertical plane at right angles with the axis of the main shaft of the engine, a second bell crank lever arranged to operate in a direction parallel to the axis of the main shaft, said bell crank levers being pivotally supported by the adjustable plate, a common operating lever for said controlling means, a connecting rod for one of said bell crank levers between the same and said operating lever, and connecting means between said bell crank levers, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

BARRETT D. TILLINGHAST.
HARRY B. PORTERFIELD.

Witnesses:
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W. G. DOOLITTLE.