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March 24, 1931. J. J. RANDOLPH 1,798,108

ATTACHMENT FOR WELL DRILLING DEVICES

Filed Feb. 15, 1929 4 Sheets-Sheet 1

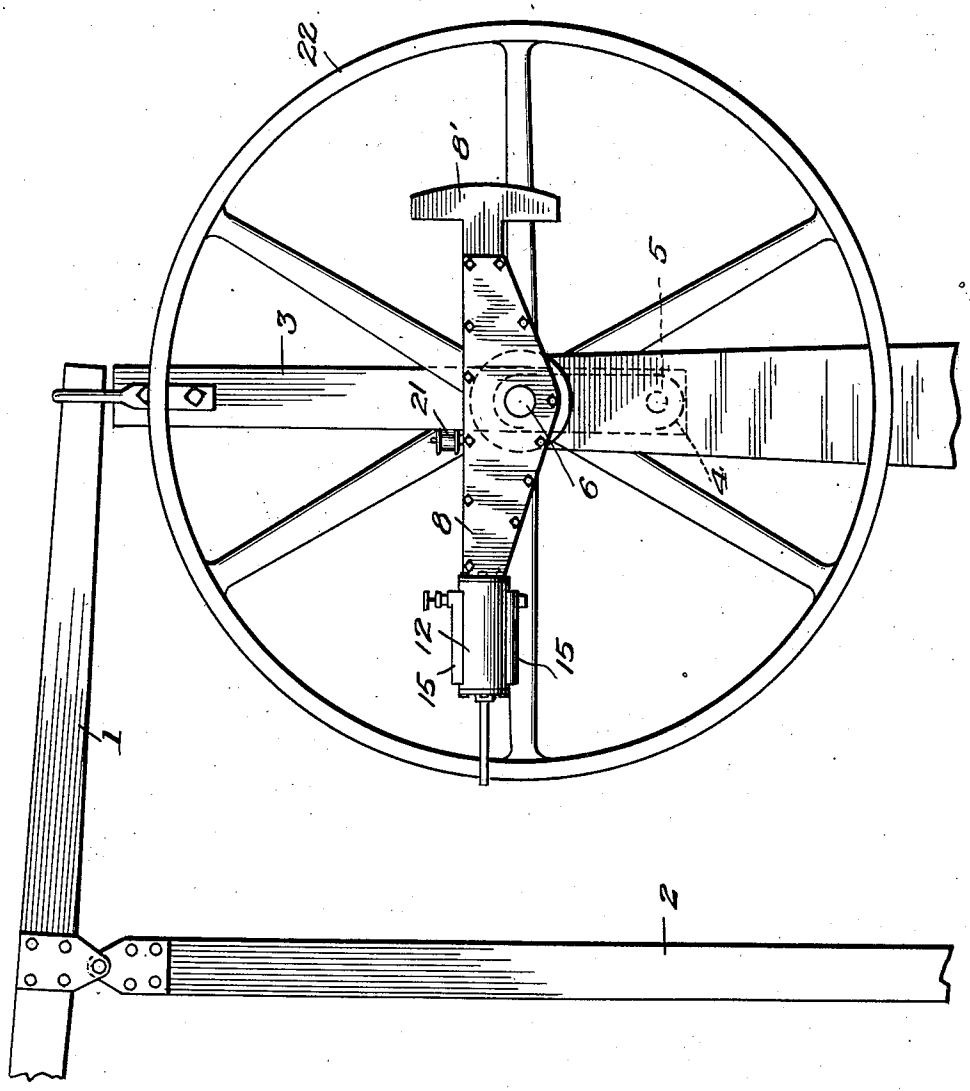


Fig. 1.

J. J. Randolph INVENTOR

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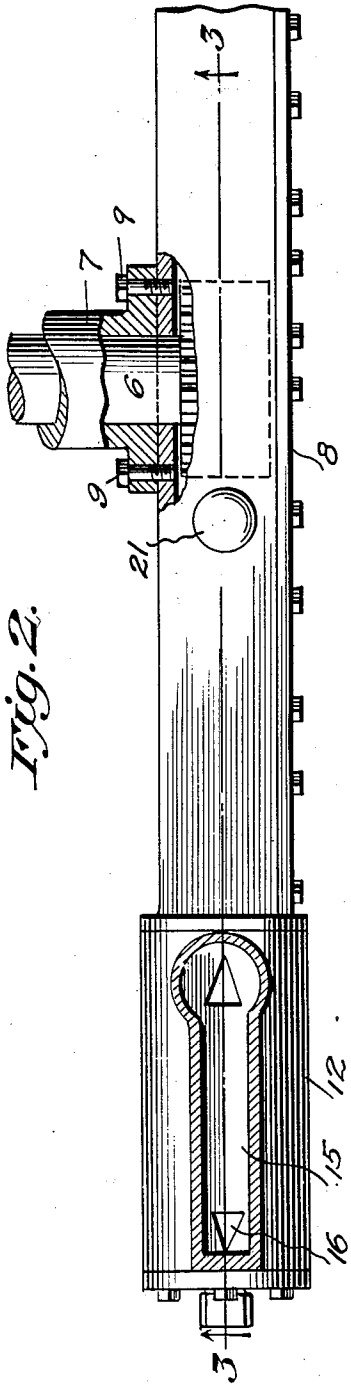


Fig. 2.

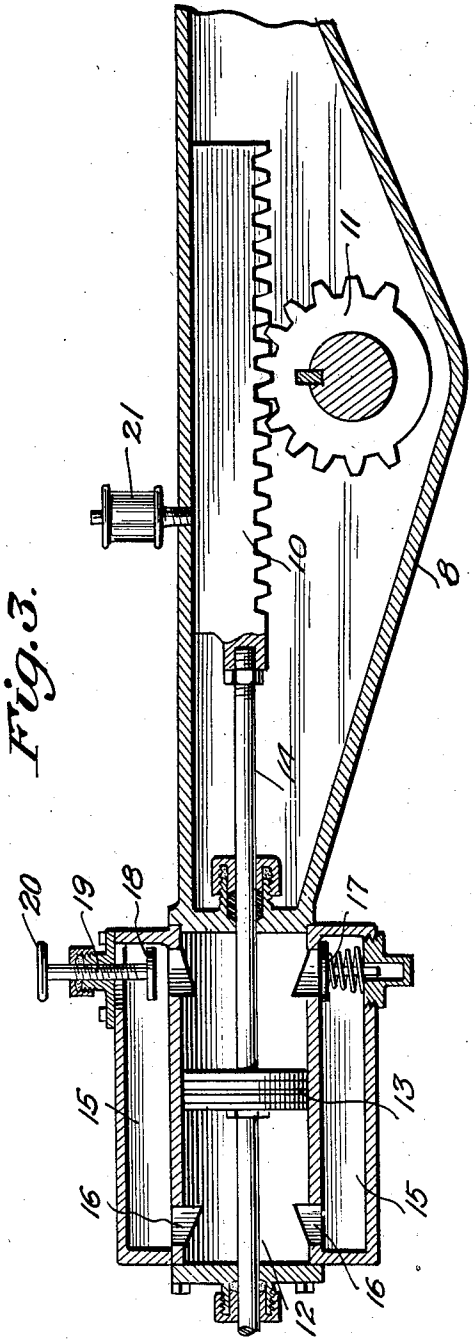


Fig. 3.

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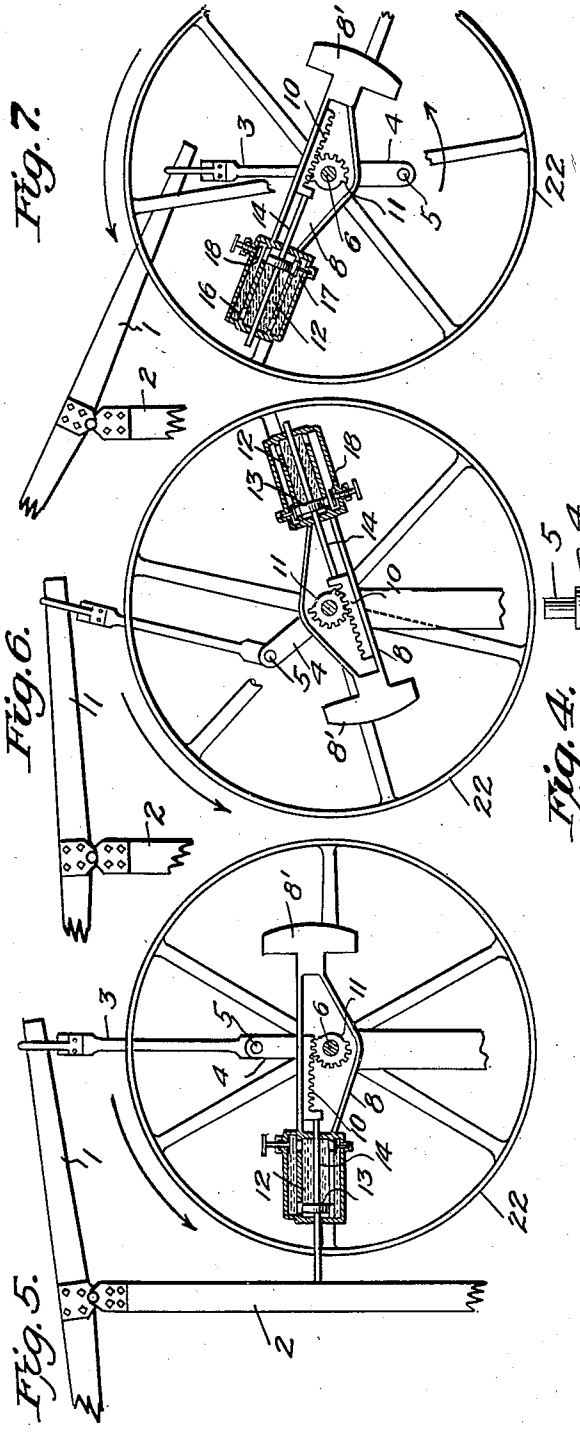


Fig. 7.

Fig. 6.

Fig. 5.

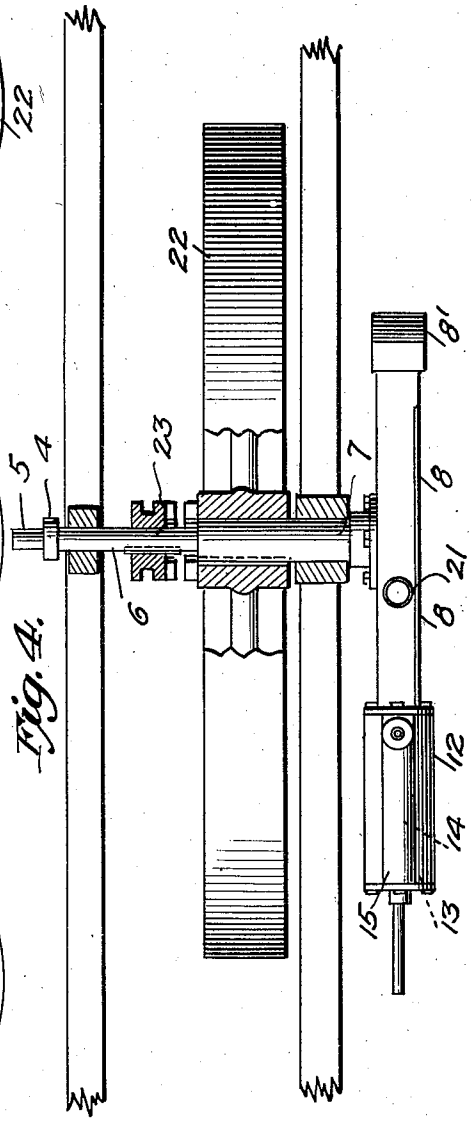


Fig. 4.

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ATTACHMENT FOR WELL DRILLING DEVICES

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Fig. 11.

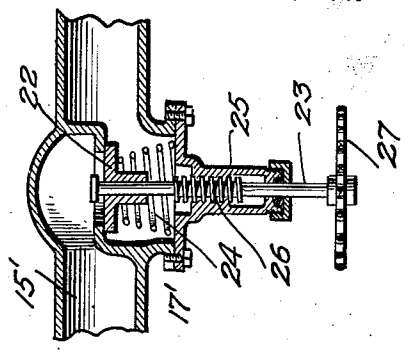


Fig. 8.

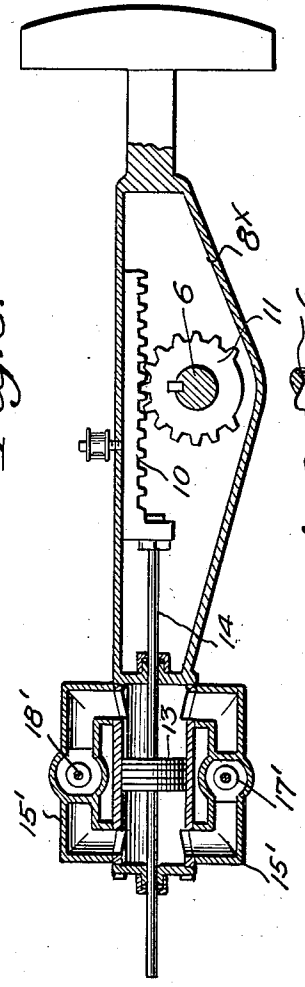


Fig. 9.

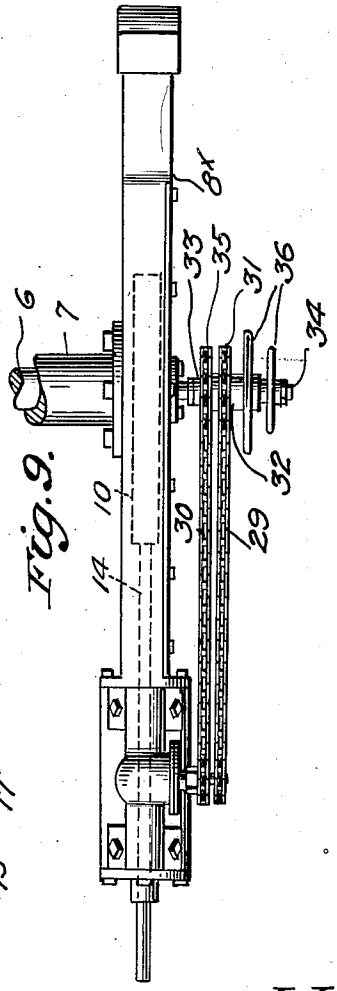
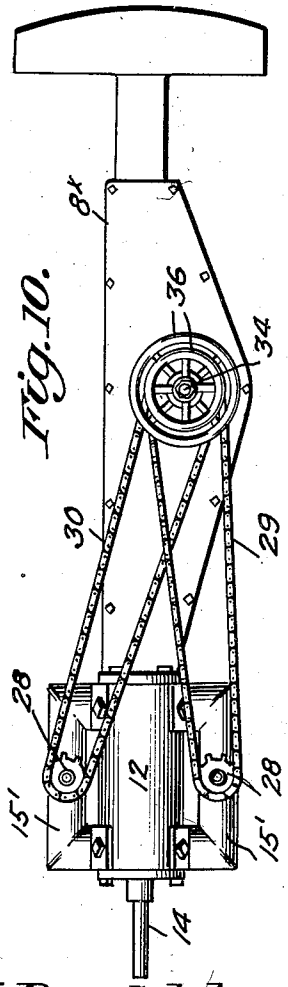


Fig. 10.



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Patented Mar. 24, 1931

1,798,108

UNITED STATES PATENT OFFICE

JAMES J. RANDOLPH, OF TULSA, OKLAHOMA

ATTACHMENT FOR WELL-DRILLING DEVICES

Application filed February 15, 1929. Serial No. 340,296.

This invention relates to an attachment for a well drilling device, the general object of the invention being to provide means for controlling the movement of the parts according to the weight of the bit used with the device and also to regulate to a limited extent the falling movement of the bit, with means for absorbing shocks incident to the movements of the parts of the device.

This invention also consists in certain other features of construction and in the combination and arrangement of the several parts, to be hereinafter fully described, illustrated in the accompanying drawings and specifically pointed out in the appended claims.

In describing my invention in detail, reference will be had to the accompanying drawings wherein like characters denote like or corresponding parts throughout the several views, and in which:—

Figure 1 is a side view of parts of a well drilling apparatus, showing the invention in use.

Figure 2 is a top plan view of the cylinder and its supporting frame which forms a part of the invention.

Figure 3 is a section on line 3—3 of Figure 2.

Figure 4 is a plan view of portions of the drilling device.

Figures 5, 6 and 7 are diagrammatic views.

Figures 8, 9 and 10 are views showing a modification.

Figure 11 is a detail sectional view through the lower valve.

In these drawings, the numeral 1 indicates the walking beam of the well drilling apparatus which is supported by the post 2 and which has one end connected by the rod 3 with the crank 4 by the pin 5, the crank being connected with the drive shaft 6. The drilling tool is connected with the opposite end of the beam in the usual manner. In carrying out my invention, I place a hollow shaft 7 on a portion of the shaft 6, the shaft 7 being rotatably arranged on the shaft 6 and a frame 8 is attached to the outer end of the shaft 7 by the bolts 9.

A rack bar 10 is slidably arranged in the frame 8 and has its teeth meshing with the teeth of a mutilated gear 11 keyed to the shaft 6. A cylinder 12 is connected with the forward end of the frame 8 and a piston 13 is arranged in the cylinder and has its rod 14 connected with the forward end of the rack bar. A by-pass 15 is arranged at each of the top and bottom parts of the cylinder with its ends in communication with the cylinder through the ports 16 which are of triangular shape in cross section, the pointed ends of the ports being arranged at the ends of the by-pass. A check valve 17 controls the inner port 16 of the lower by-pass and an adjustable valve 18 controls the inner port of the upper by-pass. This valve 18 has its stem 19 screw threaded and passing through a screw threaded opening in the wall of the by-pass, with a handle 20 on the outer end of the stem so that the valve can be adjusted by turning the stem.

The band wheel 22 is keyed to the hollow shaft and a clutch 23 is provided for connecting the shaft 6 with the hollow shaft when the drilling apparatus is to be used in the ordinary manner, as when the clutch is in operative position, the hollow shaft is fastened to the shaft 6.

A grease cup 21 is carried by the frame above the rack bar to lubricate the parts.

Figure 5 shows the parts in a position with the drilling tool or bit resting on the bottom of the well. When in this position, the crank pin is about two inches past upper center and the piston is at the outer end of the cylinder. Then on the further rotation of the band wheel, the frame 8 and the cylinder and the parts associated therewith move downwardly, but the weight of the drilling tool or bit holds the walking beam, the connecting rod and the crank and shaft 6 stationary so that the downward movement of the frame 8 will cause the rack bar to move downwardly over the stationary gear 11 which will cause the piston to move toward the inner end of the cylinder, the piston forcing the oil from this end of the cylinder through the ports and by-passes into the front end of the cylinder. As the piston passes over the inner ports 16, the flow of oil is gradually decreased owing to the peculiar

shape of the ports until the ports are entirely closed and further escape of oil is prevented and thus the piston is brought to rest with a small quantity of oil between itself and the end of the cylinder. Then further movement of the band wheel will be communicated to the shaft 6 through the rack and gear and thus the walking beam will be tilted to raise the bit. The shock due to the load being picked up by the driven parts will be absorbed by the oil trapped in the end of the cylinder by the piston and the pick-up will be gradual, due to the gradual decrease of the oil flowing through the restricted portions of the ports as the piston moves over the same. The shaft 6 with its attached parts continues to move with the band wheel, the shaft 7 and the frame until the crank passes under center, when the weight of the bit, acting through the cable, walking beam and connecting rod, forces the crank to rotate faster than the band wheel and the parts attached thereto so that the shaft 6 and the pinion 11 will rotate faster than the frame and thus the rack bar and piston are moved toward the outer end of the cylinder. In this movement of the piston, the oil flows from the outer end of the cylinder through the upper by-pass into the rear end of the cylinder and this movement of the oil is regulated by the position of the valve 18. It is, of course, impossible for the oil to pass through the lower by-pass as this is closed by the check valve 17. Thus the falling movement of the bit can be controlled to a certain extent by regulating the flow of oil from the front end of the cylinder to the rear end thereof by means of the valve 18 and this valve permits the parts to be adjusted in accordance with the weight of the bit used with the apparatus. For example, if a heavy bit was substituted for a lighter one, it would be necessary to open the valve 18 to a greater degree to allow the oil to flow more freely since the lighter the bit, the more slowly the oil would flow through the by-pass. As the piston nears the front end of the cylinder, it will pass over the upper port 16 and thus the flow of oil will gradually decrease as the piston nears the small end of the port and the flow of oil will be entirely stopped when the piston entirely covers the port so that the remaining oil in the front end of the cylinder acts as a cushion for the piston and absorbs the shock due to the sudden checking of the movement of the parts as the drill bit strikes the bottom of the well. Then the band wheel and the parts attached thereto move downwardly again, with the shaft 6 and the parts attached thereto held stationary by the weight of the bit until the piston again reaches the rear end of the cylinder, when the parts will be again connected together and the bit raised.

The device must be so designed that when the crank is in a position about three inches from upper center, or just before its speed is checked, the piston will be just starting to cover the port 16.

The device is also so arranged that in actual use, the parts would make about ¼ to ⅜ of a revolution during the dropping movement of the bit, for while the shaft 6 and the parts attached thereto are traveling faster than the band wheel and the parts attached thereto, the band wheel and its parts are moving in the same direction as the shaft 6 and the parts attached thereto. If desired, a counterbalance 8′ can be attached to the rear end of the frame 8 and it may be necessary in some cases to have a small hole in the piston to allow the escape of oil if the piston should reach the extreme end of a port 16 and become locked.

In the modification shown in Figures 8 to 11, the by-passes 15′ are bolted to the cylinder so that the by-passes are detachable. The valves 17′ and 18′ are horizontally arranged and the lower valve 17′ is so constructed that it will act as a combination stop and check valve. As will be seen from Figure 11, the valve member 22 is slidably arranged on the stem 23 and is normally held to its seat by a spring 24 which has one end engaging the valve member and its other end engaging the bonnet 25 of the valve. Thus the spring permits the valve to open outwardly under pressure exerted on the inner face of the valve, but the valve will remain closed when the pressure is exerted on its outer face.

The stem is provided with a threaded part 26 which passes through a threaded part of the bonnet, and the outer end of the stem has a sprocket wheel 27 thereon. The stem of the valve 18′ also has a sprocket 28 on its outer end and chains 29 and 30 engage these sprockets 27 and 28 and the chain 29 passes over a sprocket 31 attached to a hollow shaft 32 which surrounds a second hollow shaft 33 on a stud 34 which is carried by the housing 8ˣ and is in alignment with the axis of the shaft 6. The shaft 33 carries a sprocket 35 over which the chain 30 passes and a hand wheel 36 is arranged on the outer end of each of the shafts 32 and 33. Thus by turning one of the hand wheels, the chain 29 can be moved to adjust the valve 17′ and by turning the other hand wheel, the chain 30 can be moved to adjust the valve 18′ and these adjustments can be made while the device is in operation. The adjustment of the valve 17′ will control the tension of the spring 24 so as to regulate the opening movement of the valve member 22.

By using this combination check and stop valve 17′ in place of the ordinary check valve 17, shown in the first form of the invention, said valve 17′ can be placed in a position to check the flow of oil through the lower by-pass when the piston starts toward the gear

end of the cylinder, and by partly closing the valve 18′, the flow of oil from the gear end to the opposite end of the cylinder is checked, and thus the crank will be carried slowly downwardly by the band wheel. This slow downward movement of the crank is caused by the oil escaping slowly to the head end of the cylinder and by regulating the valve 18′, the piston can be made to come up against the trapped oil just as the crank is starting its upward movement. By using this modified form of device, there will be no shock due to the crank being started downwardly, as the valve 17′ will control the downward motion of the drill bit.

It is thought from the foregoing description that the advantages and novel features of the invention will be readily apparent.

It is to be understood that changes may be made in the construction and in the combination and arrangement of the several parts, provided that such changes fall within the scope of the appended claims.

What I claim is:—

1. In a well drilling apparatus, a hollow shaft rotatably mounted on the drive shaft of the apparatus, a band wheel connected with the hollow shaft, a frame connected with the hollow shaft, a cylinder at the outer end of the frame, a pair of by-passes carried by the cylinder, an outwardly opening check valve controlling one of the by-passes, an adjustable valve controlling the other by-pass, a piston in the cylinder, a rack bar carried by the frame and connected with the piston and a mutilated gear fastened to the drive shaft and having its teeth meshing with the teeth of the rack bar.

2. In a well drilling apparatus, a hollow shaft rotatably mounted on the drive shaft of the apparatus, a band wheel connected with the hollow shaft, a frame connected with the hollow shaft, a cylinder at the outer end of the frame, a pair of by-passes carried by the cylinder, an outwardly opening check valve controlling one of the by-passes, an adjustable valve controlling the other by-pass, a piston in the cylinder, a rack bar carried by the frame and connected with the piston, a mutilated gear fastened to the drive shaft and having its teeth meshing with the teeth of the rack bar and the cylinder having ports therein for connecting it with the by-passes, each port having a reduced outer end.

3. In a well drilling apparatus and in combination with its band wheel and crank shaft, means for connecting the band wheel with the shaft comprising a cylinder containing fluid, means for connecting the cylinder with one of the parts, a piston in the cylinder, means for connecting the piston with the other part, said cylinder having a by-pass therein and an adjustable valve for controlling the flow of fluid through said by-pass.

4. In a well drilling apparatus and in combination with its band wheel and crank shaft, means for connecting the band wheel with the shaft comprising a cylinder containing fluid, means for connecting the cylinder with one of the parts, a piston in the cylinder, means for connecting the piston with the other part, said cylinder having by-passes therein, a check valve controlling one of the by-passes and an adjustable valve controlling the other by-pass.

5. In a well drilling apparatus and in combination with its band wheel and crank shaft, a cylinder, means for connecting the same with the band wheel, a piston in the cylinder, rack means for connecting the piston with the crank shaft, said cylinder containing fluid and having a pair of by-passes, a check valve controlling one by-pass and an adjustable valve controlling the other by-pass.

6. In a well drilling apparatus and in combination with its band wheel and crank shaft, a cylinder, means for connecting the same with the band wheel, a piston in the cylinder, rack means for connecting the piston with the crank shaft, said cylinder containing fluid and having a pair of by-passes, a check valve controlling one by-pass and an adjustable valve controlling the other by-pass, the openings which connect the by-passes with the cylinder being of triangular shape with their apexes adjacent the ends of the cylinder.

7. In a well drilling apparatus and in combination with its band wheel and crank shaft, a cylinder, means for connecting the same with the band wheel, a piston in the cylinder, rack means for connecting the piston with the crank shaft, said cylinder containing fluid and having a pair of by-passes, a check valve controlling one by-pass, an adjustable valve controlling the other by-pass, and clutch means for connecting the band wheel with the crank shaft.

8. In a well drilling apparatus and in combination with its band wheel and crank shaft, a cylinder, means for connecting the same with the band wheel, a piston in the cylinder, rack means for connecting the piston with the crank shaft, said cylinder containing fluid and having a pair of by-passes, an adjustable check valve controlling one by-pass, an adjustable valve controlling the other by-pass and means for adjusting each valve while the apparatus is in motion or stationary.

9. In a well drilling apparatus and in combination with its band wheel and crank shaft, a cylinder, means for connecting the same with the band wheel, a piston in the cylinder, rack means for connecting the piston with the crank shaft, said cylinder containing fluid and having a pair of by-passes, an adjustable check valve controlling one by-pass, an adjustable valve controlling the other by-pass, means for adjusting each valve while the apparatus is in motion or stationary, such means comprising a sprocket on the stem of

each valve, a pair of shafts carried by the means which connect the cylinder with the band wheel, a sprocket on each shaft, a chain connecting each of these sprockets with each sprocket on the valves and hand wheels connected with the sprocket carrying shafts.

10. In a well drilling apparatus and in combination with its band wheel and crank shaft, a hollow shaft rotatably mounted on the crank shaft, a frame connected with the hollow shaft, a cylinder at the outer end of the frame, a counterweight at the other end of the frame, a pair of by-passes detachably connected with the cylinder, a piston in the cylinder, a rack bar movably supported in the frame and connected with the piston, a mutilated gear fastened to the crank shaft and having its teeth meshing with the teeth of the rack bar and an adjustable valve in each by-pass.

In testimony whereof I affix my signature.

JAMES J. RANDOLPH.