Oct. 4, 1932. H. L. TURNEY 1,880,222

DRAW WORK

Filed Jan. 19, 1931 5 Sheets-Sheet 1

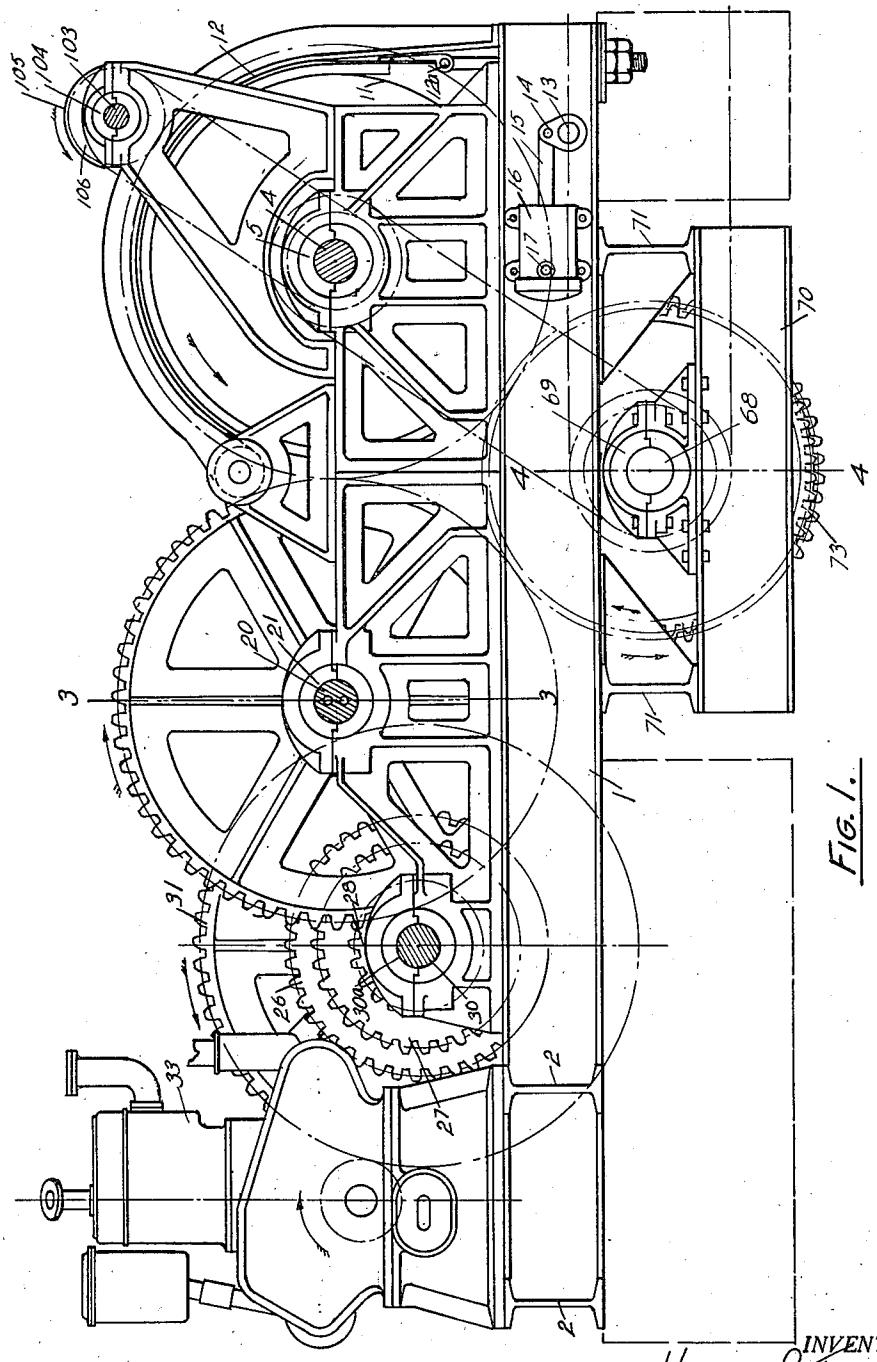


FIG. 1.

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DRAW WORK

Filed Jan. 19, 1931 5 Sheets-Sheet 2

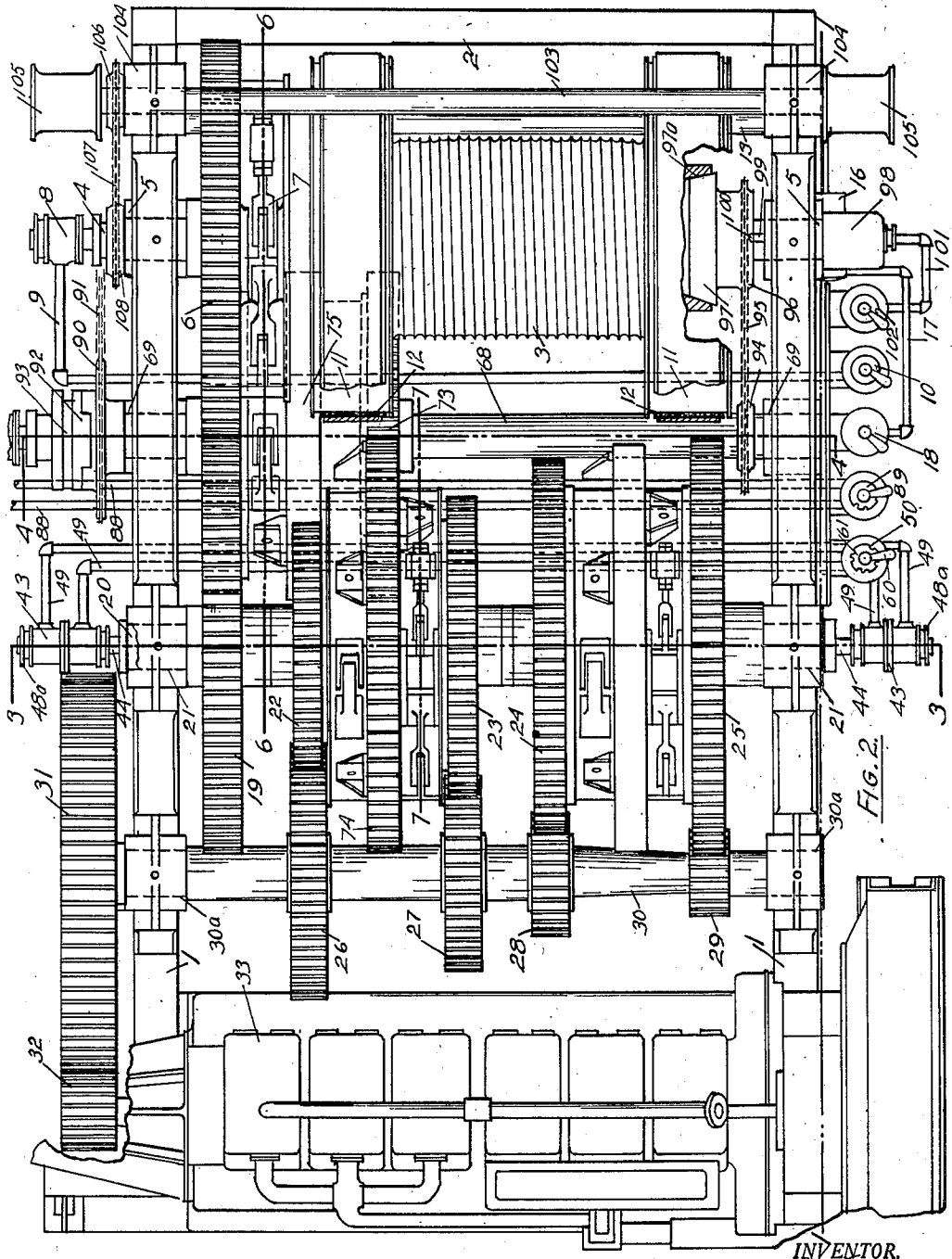


FIG. 2.

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DRAW WORK

Filed Jan. 19, 1931 5 Sheets-Sheet 3

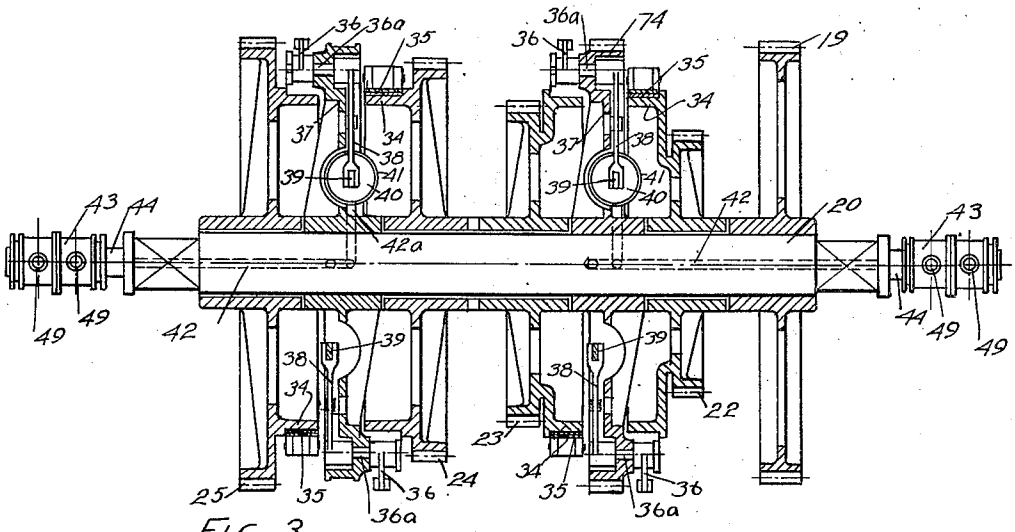


FIG. 3.

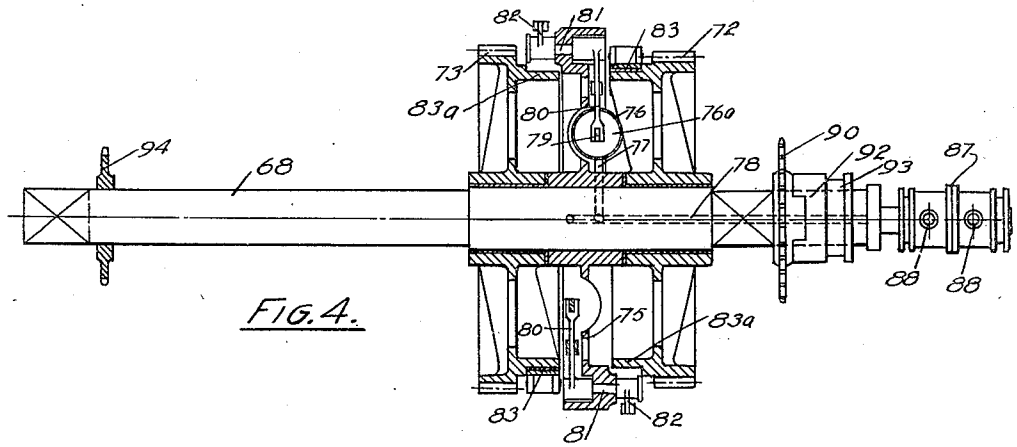


FIG. 4.

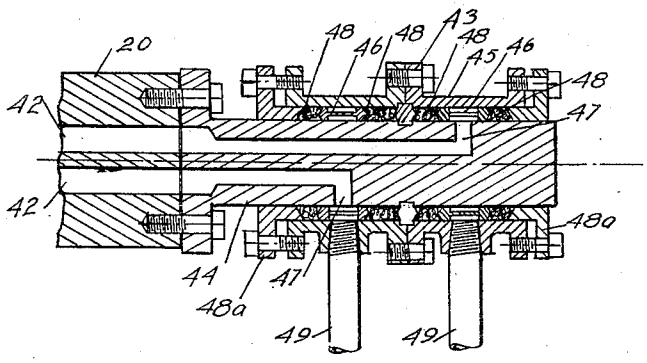


FIG. 5.

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DRAW WORK

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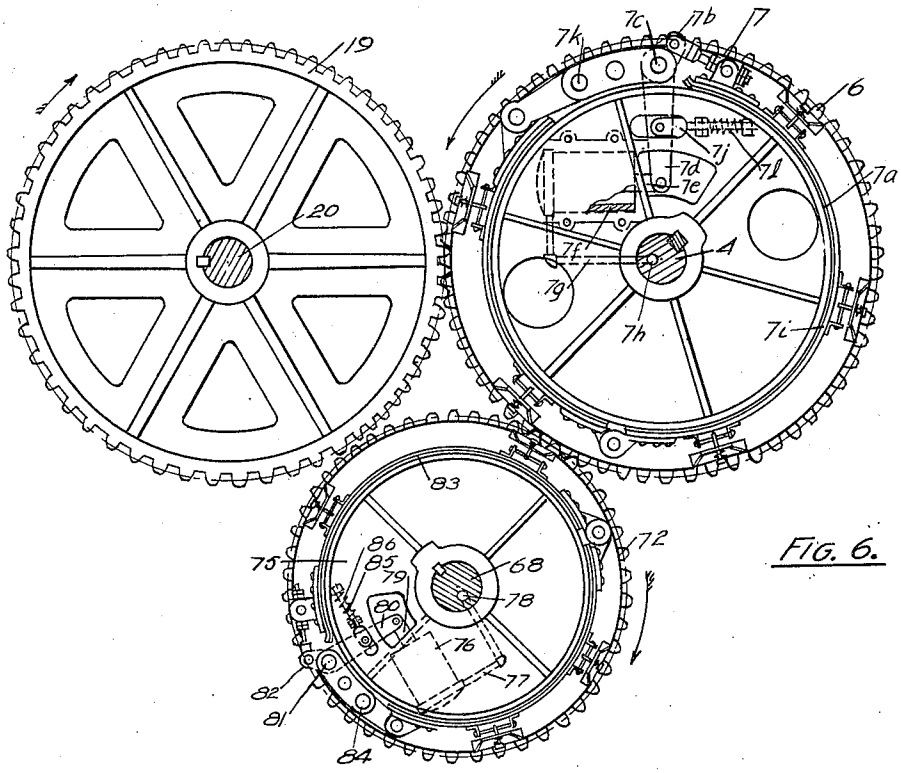


FIG. 6.

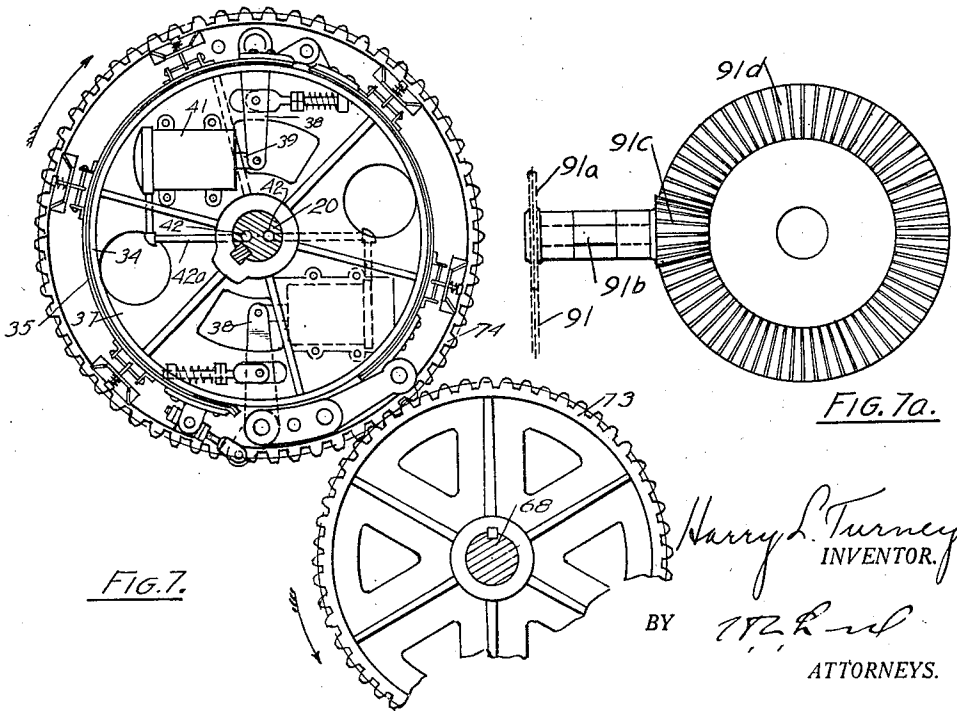


FIG. 7a.

FIG. 7.

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Oct. 4, 1932. H. L. TURNEY 1,880,222

DRAW WORK

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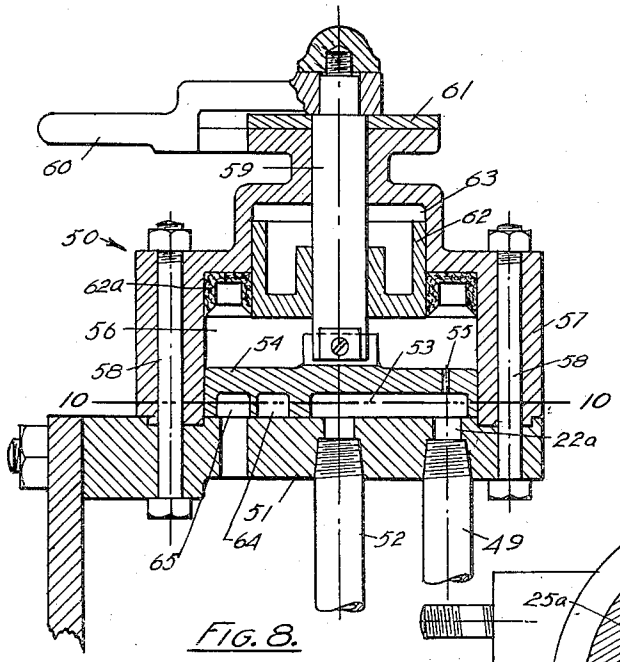


FIG. 8.

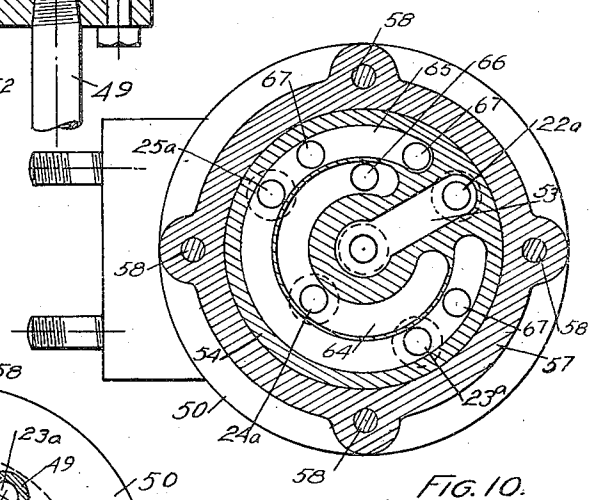


FIG. 10.

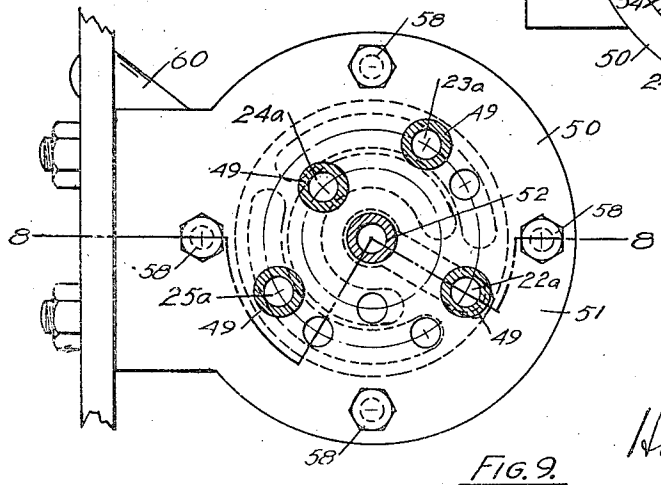


FIG. 9.

Harry L. Turney
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BY
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Patented Oct. 4, 1932

1,880,222

UNITED STATES PATENT OFFICE

HARRY L. TURNEY, OF PORTLAND, OREGON, ASSIGNOR TO PATENTS & ROYALTIES CORPORATION, A CORPORATION OF CALIFORNIA

DRAW WORK

Application filed January 19, 1931. Serial No. 509,818.

The present invention is designed to improve draw-works. With the present invention the entire mechanism, including the power plant is mounted on a single frame. The invention is formed in a very rugged and simple manner, yet in a manner giving great flexibility to the apparatus both when used in pulling and in drilling. The invention so correlates the mechanism that the speed variations which are available for one are made available for the other. The apparatus is made more compact by arranging the drilling apparatus and the pulling apparatus on two decks, the drilling apparatus being below the main frame. This permits of shortening up the apparatus and at the same time coupling up and utilizing all the available gear connections for flexibility, running one into the other. Features and details of the invention will appear from the specification and claims.

A preferred embodiment of the invention is illustrated in the accompanying drawings as follows:—

Fig. 1 is a side elevation of the apparatus, partly in section, on the line 1—1 in Fig. 2.

Fig. 2 a plan view of the apparatus.

Fig. 3 a sectional view of the speed changing shaft on the lines 3—3 in Figs. 1 and 2.

Fig. 4 a central section through the reversing shaft on the line 4—4 in Fig. 1.

Fig. 5 an enlarged section of the air connection leading to the speed-changing shaft.

Fig. 6 a section on the line 6—6 in Fig. 2.

Fig. 7 a section on the line 7—7 in Fig. 2.

Fig. 7*a* a plan view in outline of a rotary table.

Fig. 8 a vertical central sectional view through the controlling valve.

Fig. 9 a bottom view of the controlling valve.

Fig. 10 a section on the line 10—10 in Fig. 8.

The main frame has side sills 1 connected by cross beams 2. A hoisting, or pulling drum 3 is mounted on a shaft 4 carried in bearings 5 supported from the sides 1. It is driven through a gear 6 fixed on the shaft. A clutch 7 is adapted to lock the gear with the drum, the drum being mounted to run free on the shaft. The clutch 7 is air-controlled, the air connection leading through the shaft 4 by way of a passage 7*h*, a passage 8 at the end of the shaft connecting the passage 7*h* with an air supply pipe 9. The pipe 9 extends from a control valve 10 receiving its supply of air from a common source of control (not shown). The clutch 7 is shown in detail in Fig. 6. It has the usual band 7*a* operating on a band ring 7*i*. The band ring is actuated through a rock arm 7*b* carried by a shaft 7*c*, a rock arm 7*d* being connected by a pin 7*e* with a piston (not shown) in a cylinder 7*f*. The cylinder receives its air by a pipe 7*g* from the opening 7*h* in the shaft. The rock arm 7*d* has a pin 7*j* and a spring 7*l* operating on the arm releases the clutch. The usual anchorage 7*k* is provided for the band. This clutch operates in the ordinary manner of band clutches and is subject to the absolute control of the operator with the parts in motion, or stationary.

The drum 3 is provided with the usual brake drum surfaces 11 on which band brakes 12 operate. The band brakes have their movable ends secured to rock arms (not shown) on a shaft 13. The shaft 13 has a rock arm 14 connected by a link 15 with a piston (not shown) in a cylinder 16. The cylinder is supplied with air through a pipe 17 leading to a control valve 18. The usual anchorage 12*a* is supplied for the band. The brakes are thus under the immediate and convenient control of the operator, the control valves being all set to be conveniently handled by a single operator from one stand.

The gear 6 meshes with a gear 19. The gear 19 is fixed on the speed-changing shaft 20. The speed-changing shaft is journaled in bearings 21 mounted on the side frames 1. Speed-changing gears 22, 23, 24 and 25 are journaled on the shaft 20 and they mesh gears 26, 27, 28 and 29 respectively on a drive shaft 30. The drive shaft is journaled in bearings 30*a* mounted on the sides 1. It is driven by a gear 31 meshing with a gear 32 on the power shaft of a motor 33. The motor has a cross frame which extends entirely

across the main frame, the main shaft of the motor being parallel to the driving shaft 30. This simplifies the mounting of the motor, shortens and makes the apparatus more compact and braces the whole structure.

The speed-changing gears 22, 23, 24 and 25 are each adapted to be locked with the shaft 20 through clutch means. The clutch mechanism for each gear is substantially the same. Each gear is provided with a band surface, or ring 34. A clutch band 35 operates on this ring. The clutch band is actuated by a rock arm 36 carried by a rock shaft 36*a*. The rock shaft 36*a* is mounted on a carrier 37, there being one carrier between the gears 22 and 23 and another carrier between the gears 24 and 25, the clutches for one gear being arranged at one side of the carrier and the clutch for the other gear at the opposite side of the carrier. A rock arm 38 is fixed on the shaft 36*a* and is connected by a link 39 with a piston 40 carried in a cylinder 41. The cylinder 41 is connected by a pipe 42*a* with a passage 42, there being two passages 42 extending inwardly from each end of the shaft 20. The passages 42 lead to a connector 43. This is formed on an extension 44 on the end of the shaft. A sleeve 45 is arranged around the extension 44. Perforated rings 46 are arranged between the sleeve 45 and the extension and in register with radial openings 47 from the passages 42. A packing 48 is arranged at the ends of the rings 46 and followers 48*a* are provided for the packing. Pipes 49 lead into the sleeves 45 in register with the rings 46 so that a continuous connection is afforded between the pipes 49 and the passages 42 and thus with the clutches. The pipes 49 lead to a controlling valve 50 by means of which air may be delivered to any one of the clutches, or released therefrom. A control valve 50 is shown in detail in Figs. 8, 9, and 10. The valve has a seat plate 51, to the center of which a supply pipe 52 leads. Air is delivered to an inlet port 53 on the inner face of a rotative valve 54. A small opening 55 leads from the port 53 to a chamber 56 within the body 57. The body is bolted to the seat plate by bolts 58. A stem 59 is provided for the valve 54 and this is provided with an actuating handle 60 adapted to be locked in adjustment at various points on an index plate 61. A bushing 62 is fixed on the stem 59 and fits in a cylinder 63 in the body. A cup ring 62*a* is arranged around the bushing 62 and within the wall of the body 57, thus sealing the joint between the bushing and the cylinder 63. In this way a tight joint is maintained. At the same time a large part of the pressure area is removed from the valve 54, thus enough being retained to assure its seating. The valve has two arc-shaped exhaust ports 64 and 65, the port 64 operating over an exhaust opening 66 and the exhaust port 65 including the exhaust opening 67. The ports from the pipes 49 are, port 22*a* leading to the pipe 49 controlling the gear 22, port 23*a* leading to the pipe 49 controlling the gear 23, port 24*a* leading to the pipe 49 controlling the gear 24, and port 25*a* leading to the pipe 49 controlling the gear 25. Any of these ports may be brought under the inlet port 53. As shown in Fig. 10 the opening 22*a* is under the inlet port. At the same time the exhaust ports 64 and 65 and the openings 66 and 67 are so arranged that all the other clutches are released. At the same time the valve may be placed in a neutral position in which all the clutches are released. All other control clutches are made in a similar manner only when less control openings are required the number of ports leading to the valve is reduced.

It will be noted that the gears 22, 23, 24 and 25 have different gear ratios in connection with the gears 26, 27, 28 and 29 so that four different speeds are transmitted to the speed-changing shaft and that any of the speeds may be instantly selected, or changed, with the device in active operation by a mere change in the control valve 50. A reversing shaft 68 for handling the rotary drilling machine is mounted in bearings 69, the bearings being arranged on the sub-frame sills 70 which are connected with the main sills by cross beams 71. Gears 72 and 73 are journaled on the shaft 68. The gear 73 meshes with a gear 74 which is mounted on the carrier 67 of the clutch between the gears 22 and 23. The gear 72 meshes with the gear 6 and consequently the gear 6 forms an intermediate gear between the gear 19 on the shaft 20 and the gear 72. In consequence the gear 72 moves in a reverse direction from the gear 73. A clutch carrier 75 is fixed on the shaft 68. A cylinder 76 is mounted on each side of the carrier and there is a similar clutch mechanism at each side of the carrier, one for the gear 72 and one for the gear 73. Each cylinder is connected by a pipe 77 with a passage 78 in the shaft. Each cylinder is provided with a piston 76*a* connected by a link 79 with a rock arm 80. The rock arm is mounted on a shaft 81 and a rock arm 82 is fixed on the shaft 81 and a brake band 83 is secured to the rock arm 82. The brake band is anchored at 84 and operates over a brake ring 83*a* on the gear. The rock arm 80 is provided with a pin 85 on which a spring 86 operates to release the clutch when the air pressure is relieved. The passages 78 lead to a connector 87. This is similar in structure to the connector 43. Pipes 88 lead from the connector and from the passages 78 to a control lever 89 by which either of the clutches may be supplied with air, or released.

It will be seen that with this apparatus it is possible for the operator to deliver, either forward, or reverse, four speeds to the shaft 68. This is accomplished by locking the car-

rier on which the gear 74 is arranged with either the gear 22, or 23, as desired, thus accomplishing two speeds, or by leaving these clutches released locking either the gear 24, or 25, with either carrier 37, in which event the shaft 20 is operated at the speed of the gear engaged, the shaft 20 communicating the movement of the gear to the carrier 37 having the gear 74 and thence to the gear 73. In the other direction, the four speeds are used as with the hoist delivering these various speeds through the gears 19 and thus to the gear 72.

A sprocket 90 is provided on the shaft 68 and a chain 91 leads to a sprocket 91*a* carried by a shaft 91*b* driving pinions 91*c* and the main gear 91*d* of the rotary table. Thus the rotary drilling machine may be driven with four speeds and reversed, thus satisfying every requirement. A jaw clutch 92 is provided for locking the sprocket 90 with the reversing shaft. This is controlled by the usual clutch ring 93, the actuating lever of which is not shown.

It is desirable in order to give rapidity to the operation of the device to start the drum in reverse direction when the brakes are released. For this purpose a sprocket 94 is fixed on the reversing shaft 68. A sprocket chain 95 extends from this sprocket 94 to a sprocket 96. The sprocket 96 is fixed on an extension from a friction cone 97. This cone is journaled on the shaft 4 and operates in a cone socket 97*a* in the end of the hoisting drum. The cone is actuated through a friction device 98 having an operating pin 99. It has a cross pin 100 engaging the cone. Air is supplied to the friction device by a pipe 101 and is controlled by a control valve 102. Thus the operator on releasing the brakes and brake drums may, at the same time, through the control valve 102 give the drum a reverse kick to start the reverse movement with rapidity. It will be understood that the pull cables extend through several sheaves and thus are rather sluggish in permitting return movement.

A gypsy shaft 103 is mounted in bearings 104 extending upwardly from the bearings 5. This shaft has gypsy heads 105 at each end. The shaft 103 is also provided with a sprocket 106 and is connected by a chain 107 with a sprocket 108 on the shaft 4 so that the gypsy shaft may be actuated from the main drive. It will be seen, therefore, that with the present apparatus, the pulling drum, or hoisting drum may be used from the same power source as the rotary drilling machine, each apparatus being supplied with a plurality of varying speeds which are immediately available with the machine in motion so that the operator may speed up, or slow down as the conditions require immediately upon those conditions appearing. Thus the speeding of the apparatus is very much increased. By utilizing the arrangement of reversing shaft hooked into the same speed-changing shaft as the hoist, and utilizing the gears of the hoist for effecting the reverse on the reverse shaft, the whole mechanism is so shortened up as to make it entirely feasible to mount it on a single frame carrying the power unit. All the operating shafts are in parallel so that ordinary spur gears, or chains may be used for all the driving connections.

What I claim as new is:—

1. In a draw works, the combination of a frame; a drum mounted on the frame; a speed changing shaft mounted on the frame; a driving connection between the speed changing shaft and the drum; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft; means setting and releasing the last-mentioned connections at will; and a drill table driver on the reversing shaft.

2. In a draw works, the combination of a frame; a drum mounted on the frame; a speed changing shaft mounted on the frame; a driving connection between the speed changing shaft and the drum; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will; a reversing shaft; a frame below the main frame carrying the reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft; means setting and releasing the last-mentioned connections at will; and a drill table driver on the reversing shaft.

3. In a draw works, the combination of a frame; a drum mounted on the frame; a speed changing shaft mounted on the frame; a driving connection comprising gears between the speed changing shaft and the drum; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft, said last-mentioned gear connections comprising the drum gear of the driving connection between the speed changing shaft and the drum; means setting and releasing the last-mentioned connections at will; and a drill table driver on the reversing shaft.

4. In a draw works, the combination of a frame; a drum mounted on the frame; a speed changing shaft mounted on the frame; a driving connection between the speed changing shaft and the drum; a driver shaft; a plurality of gear connections between the driver

shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will comprising a clutch having a clutch carrier; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft, one of the gear connections being carried by the clutch carrier; means setting and releasing the last-mentioned connections at will; and a drill table driver on the reversing shaft.

5. In a draw works, the combination of a frame; a drum mounted on the frame; a speed changing shaft mounted on the frame; a driving connection comprising gears between the speed changing shaft and the drum; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will comprising a clutch having a clutch carrier; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft, said last-mentioned gear connections comprising the drum gear of the driving connection between the speed changing shaft and the drum and the other gear connection comprising a gear on the clutch carrier; means setting and releasing the last-mentioned connections at will; and a drill table driver on the reversing shaft.

6. In a draw works, the combination of a frame; a drum mounted on the frame; a speed changing shaft mounted on the frame; a driving connection between the speed changing shaft and the drum; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft; means setting and releasing the last-mentioned connections at will; a driving connection between the reversing shaft and the drum; and means setting and releasing said connection at will.

7. In a draw works, the combination of a frame; a drum mounted on the frame; a speed changing shaft mounted on the frame; a driving connection between the speed changing shaft and the drum; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft; means setting and releasing the last-mentioned connections at will; a drill table driver on the reversing shaft; a driving connection between the reversing shaft and the drum; and means setting and releasing said connection at will.

8. In a draw works, the combination of a frame; a drum mounted on the frame; a speed changing shaft mounted on the frame; a driving connection between the speed changing shaft and the drum; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft; means setting and releasing the last-mentioned connections at will; a drill table driver on the reversing shaft; a motor having its driving shaft parallel with the speed changing shaft, said motor being mounted on the frame; and a connection between the motor shaft and the driver shaft.

9. In a draw works, the combination of a frame; a drum mounted on the frame; a speed changing shaft mounted on the frame; a driving connection between the speed changing shaft and the drum; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft; means setting and releasing the last-mentioned connections at will; a driving connection between the reversing shaft and the drum; means setting and releasing said connection at will; a motor having its driving shaft parallel with the speed changing shaft, said motor being mounted on the frame; and a connection between the motor shaft and the driver shaft.

10. In a draw works, the combination of a frame; a speed changing shaft mounted on the frame; a driving connection; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft; means setting and releasing the last-mentioned connections at will; and a drill table driver on the reversing shaft.

11. In a draw works, the combination of a frame; a speed changing shaft mounted on the frame; a driving connection; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will; a reversing shaft; a frame below the main frame carrying the reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft; means setting and releasing the last-mentioned connections at will; and a drill table driver on the reversing shaft.

12. In a draw works, the combination of a frame; a speed changing shaft mounted on the frame; a driving connection; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will comprising a clutch having a clutch carrier; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft, one of the gear connections being carried by the clutch carrier; means setting and releasing the last-mentioned connections at will; and a drill table driver on the reversing shaft.

13. In a draw works, the combination of a frame; a speed changing shaft mounted on the frame; a driving connection; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections at will; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft; means setting and releasing the last-mentioned connections at will; a drill table driver on the reversing shaft; a motor having its driving shaft parallel with the speed changing shaft, said motor being mounted on the frame; and a connection between the motor shaft and the driver shaft.

14. In a draw works, the combination of a frame; a speed changing shaft mounted on the frame; a driving connection; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections comprising friction clutches operable at will by the operator; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft; means setting and releasing the last-mentioned connections at will; and a drill table driver on the reversing shaft.

15. In a draw works, the combination of a frame; a speed changing shaft mounted on the frame; a driving connection; a driver shaft; a plurality of gear connections between the driver shaft and the speed changing shaft of differing gear ratios; means setting and releasing the connections comprising air-actuated friction clutches operable at will by the operator; a reversing shaft; direct and reversing gear connections between the speed changing shaft and the reversing shaft; means setting and releasing the last-mentioned connections at will; and a drill table driver on the reversing shaft.

In testimony whereof I have hereunto set my hand.

HARRY L. TURNEY.