No. 607,816. Patented July 26, 1898.

J. F. ALLEN.

PORTABLE DRILLING MACHINE.

(No Model.) (Application filed June 25, 1897.) 2 Sheets—Sheet 1.

Fig. 1,

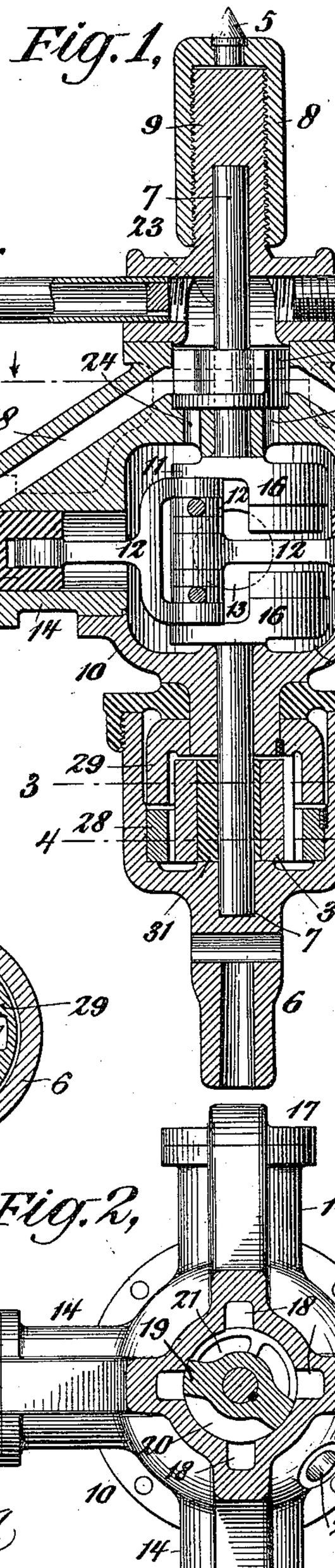


Fig. 3,

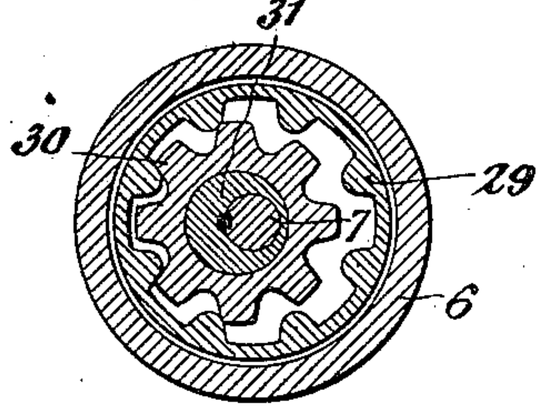


Fig. 4,

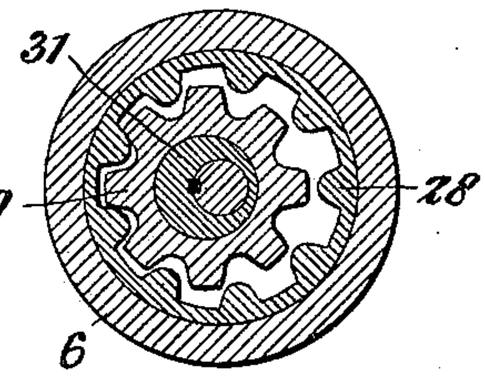
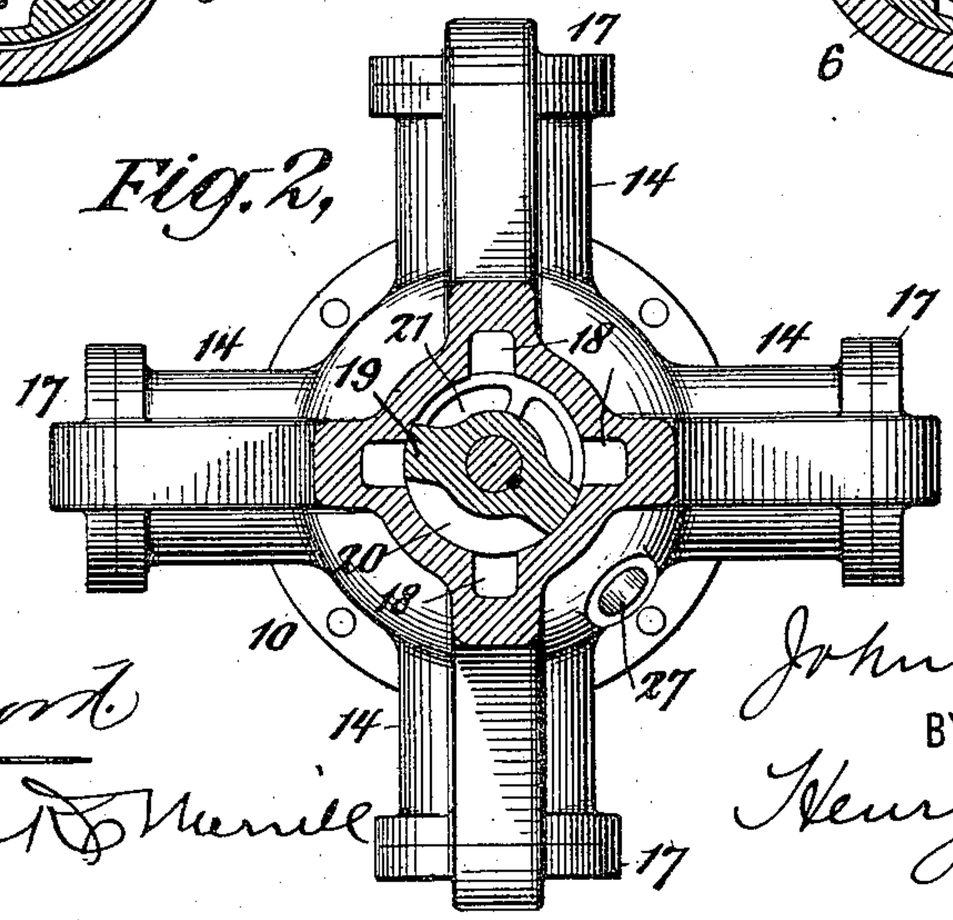


Fig. 2,



WITNESSES:

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PORTABLE DRILLING MACHINE.

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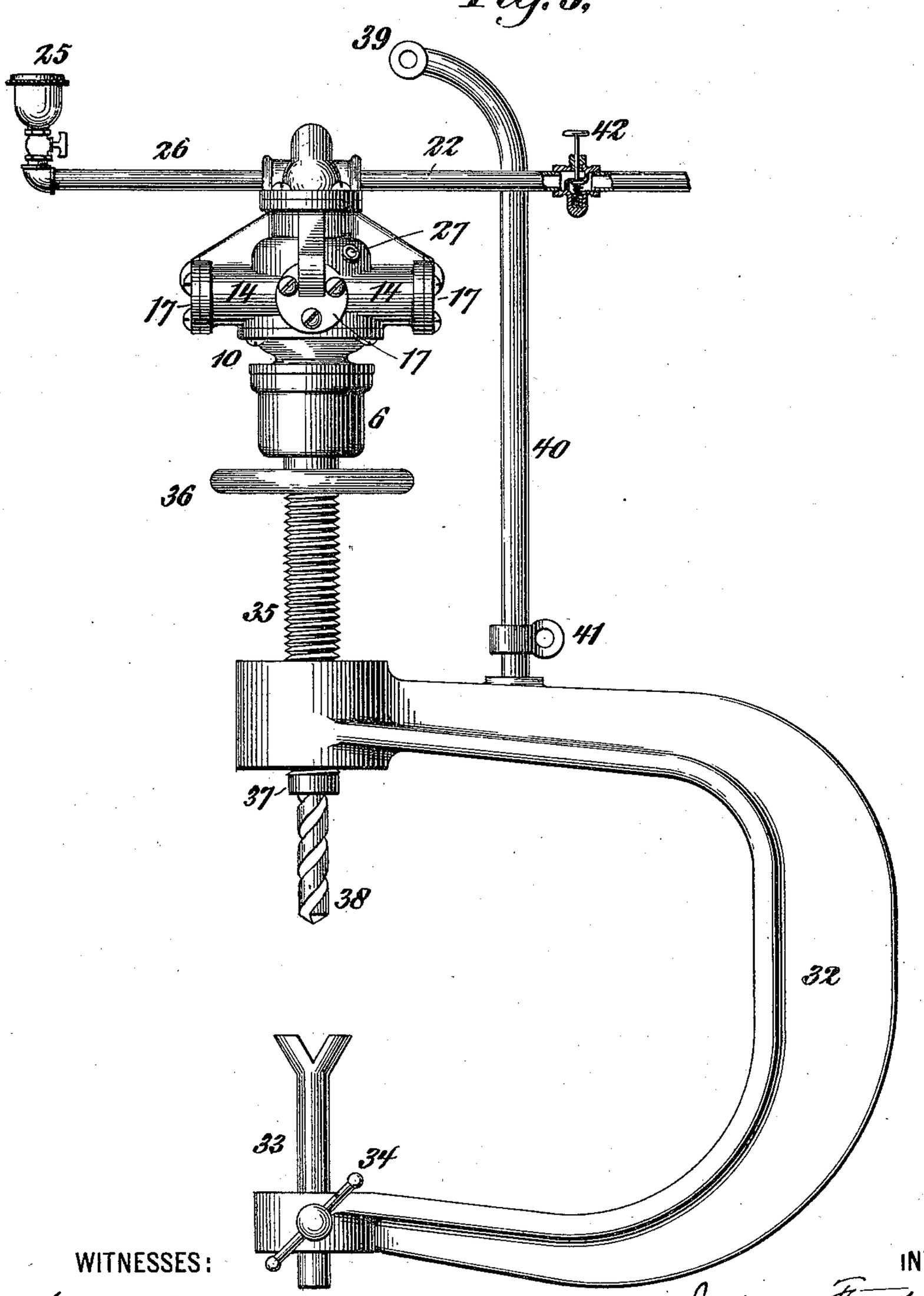
Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN F. ALLEN, OF NEW YORK, N. Y.

PORTABLE DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 607,816, dated July 26, 1898.

Application filed June 25, 1897. Serial No. 642,346. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. ALLEN, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Portable Drilling-Machines, of which the following is a specification, reference being had to the accompanying drawings, forming part hereof.

This invention relates to portable drilling-machines such as are adapted to be driven by compressed air, and has for its object to improve the construction of such machines.

The invention comprises various improvements in construction in the means for imparting rotary motion to the driving-shaft and in the means for communicating the movement of the driving-shaft with diminished velocity to the drill-head, all of which are hereinafter fully described, and set forth in the claims.

The accompanying drawings illustrate embodiments of my invention.

Figure 1 is a vertical section of a portable drilling-machine of a construction adapted to be held to its work by a brace or "old man." Fig. 2 is a transverse section of the same on the line 2 2, Fig. 1. Fig. 3 is a transverse section on the line 3 3, Fig. 1. Fig. 4 is a transverse section on the line 4 4, Fig. 1. Fig. 5 is an elevation, drawn to a reduced scale, showing the drilling-machine held in a horseshoe-frame and adapted to be suspended by a crane or other suitable means.

I will first describe the construction shown in Figs. 1 to 4, inclusive. The portable drill here shown is adapted to be held to its work by a brace or old man and has an upwardly-extending centering-point 5, adapted to enter a corresponding depression in the brace, while the drill, which may be held in any ordinary manner in the drill-head 6, will be started in a centered depression punched in the work to be drilled. The centering-point 5 and the drill-head are in longitudinal alinement, and the driving-shaft 7 is in line with the drill-head and centering-point. The centering-point 5 is fixed in an internally-threaded cup or shell 8, which screws over an upward projection 9 from the casing or frame 10, and the outer surface of the cup 8 may be milled or otherwise adapted for rotating by hand to feed the drill forward to its work.

The driving-shaft 7 is fitted to rotate in bearings in the casing 10 and has a crank medially formed upon it, and the inner ends of a number of pitmen or connecting-rods 12 12 are pivoted upon the crank-pin of this crank 11, these connecting-rods 12 being respectively pivoted at their outer ends upon a corresponding number of pistons 13 13, each piston working in a cylinder 14, formed in the casing on lines radial to the driving-shaft 7. The number of cylinders which I propose to use is four, as shown, these cylinders being disposed about the driving-shaft at equal angles or ninety degrees apart; but a greater or lesser number of cylinders may be employed in some cases.

The cylinders 14 open at their inner ends into a central chamber 15, formed in the casing, and the crank 11 is located within this chamber 15. Counterbalances 16 16 are provided, also located within the chamber 15, and, as shown, there are two counterbalances, each in one piece with an arm of the crank 11. The outer ends of the cylinders are closed by removable caps 17 17, and the ports for the admission of compressed air or other expansive fluid to the cylinders are formed in these caps 17 at the outer ends of the passages 18 18, formed in the caps and main part of the casing and extending inwardly and terminating at their inner ends in valve-ports at the outer periphery of the valve 19. The valve 19 is of cylindrical form and is formed or secured upon the driving-shaft 7 above the crank 11 and has an inlet-passage 20 and an outlet or exhaust passage 21, the inlet-passage opening at the upper end of the valve into an upper chamber 23, into which the inlet-pipe 22 enters, and the outlet or exhaust passage 21 opening at the lower end of the valve into ports and passages 24, leading into the crank-containing chamber 15. An outlet-opening 27 is formed in the outer wall of the crank-containing chamber 15 for the final escape of the compressed air or other actuating fluid.

A reservoir for lubricating fluid is provided, shown as an oil-cup 25, (see Fig. 5,) secured at the outer end of the pipe 26, and

the pipe 26 is secured at its inner end to the casing 10, and the inner end of the pipe 26 has a restricted orifice, shown as formed by a plug with one or more openings therethrough, and this restricted orifice leads into the upper or inlet chamber 23. The lubricating fluid is allowed to drip or flow in regulated quantities and will enter the upper or inlet chamber and drop upon the valve 19 and lubricate the valve and will be carried by the inflowing compressed air or other fluid through the passages 18 to the cylinders and pistons, so as to thoroughly lubricate them, and will be carried by the exhaust through the passages 24 into the crank-containing chamber 15, so as to flow upon and lubricate the crank and connecting-rods. The outlet-opening 27 in the walls of the crank-containing chamber 15 is located at the upper portion of the chamber, so as not to drain the chamber of lubricant. The exhaust compressed air or motive fluid which enters the large crank-containing chamber 15 is retained therein a sufficient time to drop any liquid particles carried by it, and thus the lubricating fluid is not thrown or drawn out through the outlet-opening 27. It will also be observed that as the cylinders 14 open into the crank-containing chamber and the bearings for the driving-shaft 7 open into the crank-containing chamber all lubricating fluid discharged from the cylinders must enter the crank-containing chamber. All lubricating fluid which works downward from the valve and upper bearings of the crank-shaft must enter the crank-receiving chamber, and lubricating fluid will flow from the crank-containing chamber into the lower bearings of the crank-shaft, so as to lubricate the lower parts of the machine.

The engine above described must be actuated at high speed to develop the amount of power required. By reason of the effective lubrication and the counterbalancing of moving parts, and also by reason of the extreme simplicity of the valve and other parts of the engine, a very high speed may be developed. In communicating the motion from the driving-shaft to the drill-head the velocity must be materially diminished, and I have devised improved means to that end, which I will now describe.

The drill-head 6 has its upper bearing upon the frame 10, while its lower bearing is upon the lower end of the driving-shaft 7. An internal gear 28 is secured to the drill-head, and another internal gear 29 is arranged in line with the internal gear 28 and secured to the frame 10. A long pinion or gear 30 is fitted to rotate upon an eccentric 31, secured upon the driving-shaft 7, and this gear 30 meshes with both internal gears 28 and 29. One of the internal gears contains a greater number of teeth than the other, and as the gear 30 is moved about by the eccentric a relative movement of the internal gears takes place in accordance with the difference in the number of teeth of the two internal gears. In the construction shown the internal gear 29 has eight teeth and the internal gear 28 has nine teeth, and the relative movement of the internal gears resulting from one revolution of the eccentric is one tooth of the internal gear 28. As the internal gear 29 is held to the frame and the frame is not permitted to revolve, this movement is imparted to the internal gear 29, which moves forward one tooth or one-ninth of a revolution for each complete revolution of the driving-shaft and eccentric. The number of teeth shown of the gear 30 is eight, corresponding to that of the fixed internal gear 29, and therefore the gear 30 has no rotative movement relatively to the frame, but is held by the internal gear 29 from rotative movement relatively to the frame as it is moved about in engagement with the internal gear 29 by the rotation of the eccentric. This construction is exceedingly simple as to all details of manufacture, including fitting of parts, and requires a minimum number of parts, and is also exceedingly durable.

For convenience in the assembling or taking apart of the machine the drill-head 6 is made in two parts threaded together, the upper part being the upper bearing-disk and the lower part being cup-shaped and having a downward projection containing the drill chuck or socket. So, also, the casing 10 is made in three pieces exclusive of the caps 17, the lower piece terminating just below the cylinders 14 and the middle piece terminating just above the valve 19 and these three pieces or parts being held together by bolts or screws. For a like purpose the upper crank 11 may be removed from the crank-pin, the crank-pin being fixed only in the lower crank.

It is to be noted that the strains of the various connecting-rods on the crank-pin are centered, the right-hand connecting-rod bearing medially upon the pin and the other connecting-rods being yoked successively, so that in each connecting-rod the two parts have their bearings at equal distances above and below the middle of the crank-pin.

It is of course evident that various modifications may be made in the construction above particularly described within the purview of my invention. An example of a modification is illustrated in Fig. 5, which shows the drilling-machine held in a horseshoe-frame. This horseshoe-frame 32 has a lower socket containing a back brace-pin 33, adjustable through a hand-screw 34, and an upper threaded socket which receives a long threaded sleeve 35, having a hand-wheel 36 at its upper end. This threaded sleeve is fitted over the downward projection of the drill-head, so that the drill-head may rotate independently thereof, but is compelled to move longitudinally therewith, the collar 37 being secured at the lower end of the drill-head and the downward projection of the drill-head being considerably longer than in

the construction shown in Fig. 1. The drill 38 is shown in working position in Fig. 5 and is registered by screwing down the sleeve 35 until the drill, entering the usual centered cavity in the work, presses the work against the back brace 33. A drilling apparatus thus mounted in a horseshoe-frame is usually supported by a crane or traveler, and to that end I provide an eye 39 at the upper end of a rod or bar 40, extending upwardly from the horseshoe-frame 32, this eye 39 being so placed that the parts when suspended thereat will be supported, with the drill, in the vertical position shown. I also provide another eye 41, shown as at the lower end of the bar 40 and so located that the parts when suspended thereat will be supported, with the drill, in horizontal position. The bar 40 also serves to prevent rotation of the drill-casing, the inlet-pipe 22 coming in contact therewith. It is to be also noted that the oil-inlet pipe 26 may come in contact with the bar 40 and perform a like function. So, also, in the construction shown in Fig. 1 either of the pipes 22 or 26 will prevent rotation by contact with the brace or old man to be used with such construction.

As above described, the feed-screw in the construction shown in Fig. 5 is formed upon a sleeve 35, fitted over the drill-head. This obviates the upwardly-extending threaded stud 9 and screw-sleeve 8, (shown in Fig. 1,) and the casing extends upwardly only a sufficient distance to provide a closed bearing for the upper end of the driving-shaft 7. In other respects the construction shown in Fig. 5 is precisely the same as in the other figures of the drawings, and the parts are similarly indicated by reference-numerals.

For convenience in controlling the drill it is desirable that the supply of compressed air or other expansive fluid may be readily controlled, and for this purpose I propose to use a compression-valve 42, as shown in Fig. 5, located in or connected to the inlet-pipe 22. The operator may manipulate this valve 42 with one hand, while with the other he works the feed-screw to feed the drill forward. The rapidity of the operation is such that the valve has to be held open only for short intervals of time. The engine starts up from any position and applies its power uniformly, and the power developed or the speed of operation are all under the control of the operator through his manipulation of the valve 42.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a portable drilling-machine, in combination, a driving-shaft, a drill-head in longitudinal alinement therewith, an eccentric fitted on the driving-shaft, a gear-wheel fitted to rotate on said eccentric, an internal gear fixed to the frame and concentric with said driving-shaft, another internal gear fixed to the drill-head and concentric with said driving-shaft, said internal gears being arranged side by side and one containing a greater number of teeth than the other, and the gear-wheel on the eccentric meshing with both internal gears, substantially as set forth.

2. A portable drilling-machine comprising a driving-shaft and a crank thereon, multiple cylinders and pistons therefor and connecting-rods respectively joining said pistons to said crank, a drill-head in longitudinal alinement with said driving-shaft, an eccentric fixed upon said driving-shaft, a gear-wheel fitted to rotate on said eccentric, an internal gear fixed to the drill-head and concentric with the driving-shaft, and connecting means holding said gear from rotation relatively to the frame, substantially as set forth.

3. A portable drilling-machine comprising a driving-shaft and crank thereon, multiple cylinders and pistons therefor and connecting-rods respectively joining said pistons to said crank, a drill-head in longitudinal alinement with said driving-shaft, an eccentric fixed upon said driving-shaft, a gear-wheel fitted to rotate on said eccentric, an internal gear fixed to the frame and concentric with said driving-shaft, another internal gear fixed to the drill-head and concentric with said driving-shaft, said internal gears being arranged side by side and one containing a greater number of teeth than the other, and the gear-wheel on the eccentric meshing with both internal gears, substantially as set forth.

4. A portable drilling-machine comprising a driving-shaft and crank thereon, multiple cylinders and pistons therefor and connecting-rods respectively joining said pistons to said crank, a drill-head in longitudinal alinement with said driving-shaft, and connecting means between said driving-shaft and drill-head whereby the movement of said driving-shaft is communicated with diminished velocity to said drill-head, substantially as set forth.

5. A portable drilling-machine comprising a casing containing multiple cylinders, a driving-shaft and crank thereon, a piston in each of said multiple cylinders and a connecting-rod joining each of said pistons to said crank, said multiple cylinders being disposed about said driving-shaft on lines radial thereto, and being closed at their outer ends and open at their inner ends, a valve on said driving-shaft, said casing containing ports and passages leading from said valve to the outer ends only of said cylinders, a drill-head in longitudinal alinement with said driving-shaft, and connecting means between said driving-shaft and drill-head whereby the movement of said driving-shaft is communicated with diminished velocity to said drill-head, substantially as set forth.

6. A portable drilling-machine comprising a casing containing multiple cylinders, a driving-shaft and crank thereon, a piston in each of said multiple cylinders and a connecting-rod joining each of said pistons to said crank,

said multiple cylinders being disposed about said driving-shaft on lines radial thereto and being closed at their outer ends and opening at their inner ends into a chamber formed in the casing and containing said crank, a valve on said driving-shaft, said casing containing an inlet and passage leading to said valve and an oil-inlet leading to said valve, and said casing containing ports and passages leading from said valve to the outer ends only of said cylinders and from the valve to the interior of the crank-containing chamber, and said casing having an outlet from said chamber, and a drill-head and connecting means between said driving-shaft and drill-head whereby the movement of said driving-shaft is communicated with diminished velocity to said drill-head, substantially as set forth.

7. In combination, a casing containing multiple cylinders, a driving-shaft and crank thereon, a piston in each of said multiple cylinders and a connecting-rod joining each of said pistons to said crank, said multiple cylinders being disposed about said driving-shaft on lines radial thereto, and being closed at their outer ends and opening at their inner ends into a chamber formed in the casing and containing said crank, a valve on said driving-shaft, said casing containing an inlet and passage leading to said valve and an oil-inlet leading to said valve, and said casing containing ports and passages leading from said valve to the outer ends only of said cylinders, and leading from the valve to the interior of the crank-containing chamber, and said casing having an outlet from said chamber, substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 21st day of June, A. D. 1897.

JOHN F. ALLEN.

Witnesses:

HENRY D. WILLIAMS,

AMBROSE K. MERRILL.