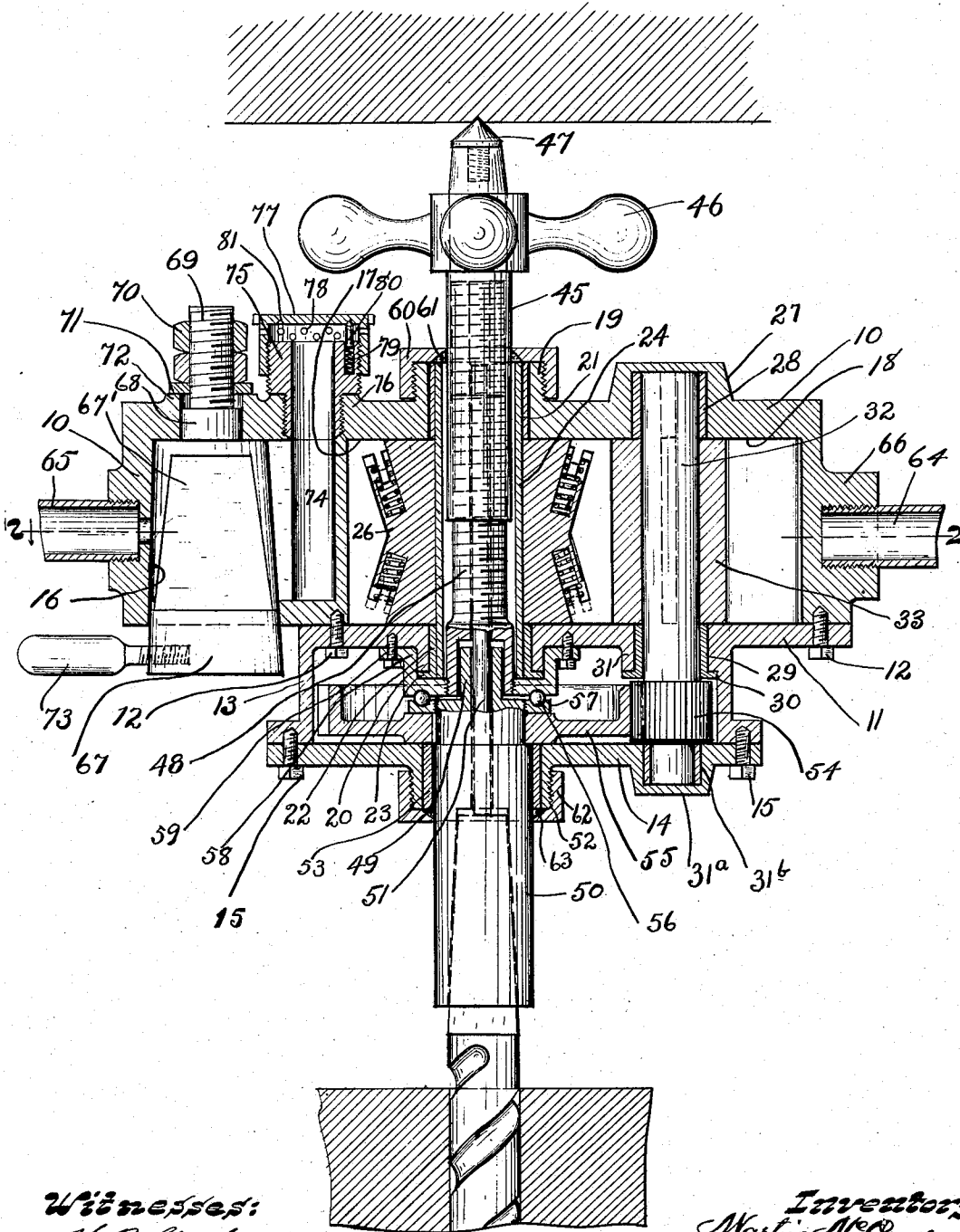


M. McCUNE & J. F. MELOUN.
PNEUMATIC DRILL.
APPLICATION FILED JULY 24, 1908.

933,326.

Patented Sept. 7, 1909.
2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

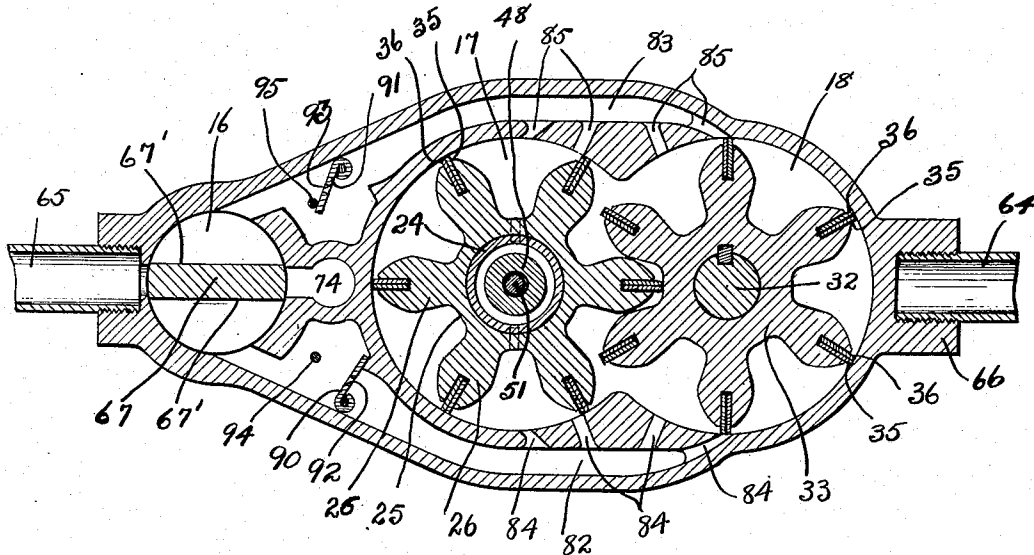


Fig. 3.

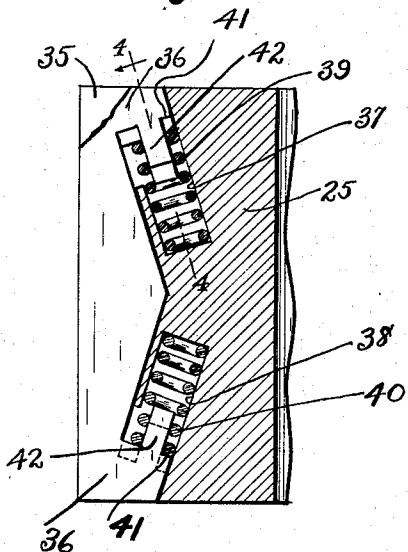
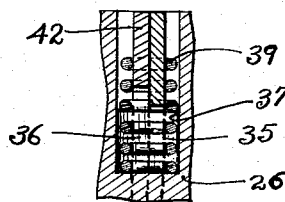


Fig. 4.



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UNITED STATES PATENT OFFICE.

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PNEUMATIC DRILL.

933,326.

Specification of Letters Patent.

Patented Sept. 7, 1909.

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To all whom it may concern:

Be it known that we, MARTIN McCUNE and JOSEF F. MELOUN, citizens of the United States of America, and residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Pneumatic Drills; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

This invention relates to motor drills and particularly pneumatic drills.

One of the objects of our invention is the provision of a drill which is powerful, strong and durable, and able to withstand without injury hard usage, pressure and stresses to which a device of this character is subjected.

A further object is the provision of a drill which is small and compact considering the power developed and in which the moving parts are so arranged and supported that they will not get out of order or be subjected to material wear.

The drill forming the subject matter of this invention is of the fluid actuated rotary motor type, and we prefer to employ air as the motive fluid although other motive fluids might be employed.

Our invention consists in certain novel details of construction and combination and arrangement of parts which will be described in the specification and set forth in the appended claims.

Reference is had to the accompanying drawings in which—

Figure 1 is a vertical sectional view of a drill constructed in accordance with our invention. Fig. 2 is a transverse sectional view taken substantially along the line 2—2 of Fig. 1 looking in the direction indicated by the arrow. Fig. 3 is an enlarged detail sectional view of a portion of one of the fluid actuated rotary driving members and blades carried thereby. Fig. 4 is a section on line 4—4, Fig. 3.

In carrying out our invention any preferred form or construction of parts may be employed as long as they possess the necessary characteristics, but in the drawings we have shown one embodiment which meets the requirements very efficiently.

For the sake of clearness and convenience of description we shall employ the terms

“top” and “bottom” or “upwardly” and “downwardly” to the drill in the position shown in Fig. 1, although it is to be understood of course that in use, the drill may be inverted or supported at right angles to that shown in Fig. 1.

Referring now to the figures of the drawings 10 represents the drill casing which may be formed of cast iron or other cast metal, and is provided at the bottom with a removable cover 11, which is held tightly against the main portion of the casing by screws 12, the adjacent faces being carefully machined so that an air tight joint is provided. The cover 11 which is provided at the bottom with a flange or wall 13 serves as a gear casing, as will be described, and is provided at the bottom with a removable cover 14 secured to the bottom of the wall 13 by screws 15. The casing is provided on the interior with a compartment 16 forming a valve chamber and with two compartments 17 and 18 in open communication with each other and in line with the valve chamber 16, the compartments 17 and 18 having cylindrical walls forming cylinders, which receive the fluid actuated rotary driving members to be described. The valve chamber 16 communicates with the cylindrical compartments 17 and 18 by inlet and outlet ports and passages which will be referred to later.

The top of the casing 10 is provided at the center with an upwardly extending flange 19 threaded on the exterior and also with an opening or bore, both the flange and the opening being concentric with the axis of the compartment 17 which is likewise the axis of the drill. In a similar manner the cover 11 is provided with a depending but unthreaded flange 20 corresponding to the flange 19 and with an opening or bore in line with the similar opening at the top and also concentric with the axis of the compartment 17. Fixed in the openings of the casing 10 and in the cover 11, are bearing sleeves 21 and 22, the latter having at the bottom a laterally extending flange 23 which takes against the bottom of the depending flange 20.

Engaging the inner walls of the bearing sleeves 21 and 22 with a close but working fit, is a hollow cylindrical shaft 24, to which is keyed or otherwise secured one of the rotary fluid actuated driving members, which in the present case is in the form of a gear having radial wings or teeth 26. At

the top of the casing 10 above the compartment 18, is a boss 27 and the casing wall and this boss is provided on the interior with a cylindrical recess, which is concentric with the inner cylindrical wall of the compartment 18 and in which is fixed a hollow cylindrical bearing sleeve 28. Likewise the cover 11 is provided with a cylindrical opening or bore in line with the cylindrical recess above referred to and concentric with the cylindrical wall of the compartment 18. In this passageway is fixed a hollow cylindrical bearing sleeve 29, which is provided at the bottom with a laterally extending flange 30, which engages the face of a boss or flange 31. The cover 19 of the gear casing is provided with a recessed boss 31^a similar to the one at the top of the casing but slightly smaller and in this recess is fixed a bearing sleeve 31^b. The bearing sleeves 28, 29 and 31^b receive with a close but working fit a shaft 32 to which is keyed or otherwise secured a second rotary fluid actuated driving gear 33 similar in every respect to the driving gear 26 in the compartment 17. As is shown in Fig. 2 the teeth of these two driving gears 26 and 33 intermesh when driven by the impinging of the air or other motive fluid upon the teeth. The power derived in these gears is transmitted to the shaft 32 and to a drill socket by suitable gearing which will be described later. The teeth of the gears 26 and 33 do not directly engage the cylindrical walls of the corresponding compartments, but each is provided with a pair of blades or plates 35 and 36 which are pressed outward by springs so as to engage the walls of the cylinders or compartments at all times. By referring to Figs. 1 and 3 it will be seen that the blades of each tooth are in a slot which extends the entire length of the tooth and is somewhat V-shaped, being deeper at the middle of the tooth than at its ends. It will also be seen that in the slot of the tooth there are two oppositely arranged sockets 37 and 38 extending diagonally inward from opposite ends and in these sockets are arranged coil springs 39 and 40. Each blade is provided a short distance from each end with a shoulder 41 and with a tongue or projection 42 which extends into the corresponding coil spring. By referring particularly to Fig. 3 it will be seen that the shoulders 41 at the upper portions of the blades and the shoulders 41 at the lower portions of the blades are not in line, but at the top the shoulder of one blade 35 extends below the shoulder of the other blade, and at the bottom the shoulder of the latter blade 36 is above the shoulder of the first-mentioned blade. The result of this construction is that the spring 37 bears only upon the shoulder of the blade 35 and forces the same upward into engagement with the top of the casing 10, and the spring

38 engages only the shoulder on the blade 36 and forces the same downward into close engagement with the surface of the cover 11. Consequently when the drill is in use the blades will at all times be in close engagement with the top and bottom of the casing due to the pressure of the springs, and will at all times be in close engagement with the cylindrical walls of the compartment 17 and 18 due to the centrifugal force and also to the lateral components of the pressures of the springs. It will be seen that the coil springs which surround the tongues of the blades support and hold the latter both at the top and bottom. With this construction there can be little leakage of the motive fluid between the blades and the walls of the compartments and at the same time the blades will be automatically adjusted by the springs for wear.

Extending down into the top of the casing and into the hollow shaft 24 is a feed screw 45 which is provided with a hand wheel 46 fixed thereto and at the top with a sharp spud 47 adapted to bear against an abutment during the drilling operation, the spud having a threaded shank which engages a threaded opening in the end of the feed screw. The latter is hollow for a portion of its length and is threaded on the interior, and receives a feed nut 48, which extends down below the hollow shaft 24, and is slightly enlarged at its lower end and is threaded on the exterior a short distance from the end. This feed nut is provided at its lower end with a socket in which extends the reduced end of a drill socket 50. The feed nut 48 is also provided with a comparatively small centrally located passageway extending from end to end, in which passageway is located a rod 51, the upper end of which extends above the feed nut and the lower end of which extends down into the drill socket 50. The purpose of this rod is to eject the drill from the drill socket when it is desired to remove the drill. This is done by merely lowering the feed screw onto the nut until the feed screw engages the rod and forces the drill out. The cover 14 of the gear casing 11 is provided with a depending flange 52, which is threaded on the exterior and also with an opening or bore concentric with the axis of the drill, said passageway having secured therein a cylindrical bearing sleeve 53 for the drill socket 50.

The power derived from the driving gears 25 and 33 is transmitted to the drill socket 50 by means of a pinion 54 secured to the shaft 32 intermediate the bearing sleeves 29 and 31^b, and by a gear 55 which is keyed to a slightly reduced portion of the drill socket within the gear casing. The upward pressure of the tool holder is transmitted to the feed screw by means of ball bearings 56, a ball race 57 arranged on the upper face of

the gear 55 and preferably secured to the end of the drill socket, and a ball race 58 which is threaded to the lower end of the feed nut 48, and is secured to the cover 11 by screws 59.

The escape of the motive fluid at the top of the casing around the feed screw is prevented by a stuffing box 60 in the form of a cap which is screwed tightly onto the threaded flange 19 and having a centrally located opening through which the feed screw extends, the stuffing box having suitable packing 61 which engages the feed screw. For the same purpose the threaded flange 52 of the cover 14 of the gear casing is provided with a stuffing box 62 through which the drill socket 50 extends, suitable packing 63 engaging the shank of the drill socket.

We shall now describe the valve mechanism and the other means for supplying motive fluid to the drill and exhausting the same therefrom.

By referring to Fig. 1 it will be seen that the drill is provided with two oppositely extending tubular members 64 and 65, the former of which is screwed into a threaded recess of a boss 66 and the latter being screwed into an opening in the wall of the casing which opening communicates with the valve chamber 16. As is evident these tubular members 64 and 65 serve as handles in supporting or moving the drill, and the tubular member 65 serves also as an inlet pipe for the motive fluid.

The inner wall of the valve chamber is somewhat tapered and at the bottom is provided with a comparatively large opening and at the top with a smaller opening. In the valve chamber 16 is a valve 67, the body or main portion of which is in the form of a truncated cone having two flat faces 67', the conical portion of the valve fitting closely the tapered or conical wall of the valve chamber. At the top the valve is provided with a reduced portion 68 of a size to engage closely the upper opening in the casing wall and with a threaded shank 69 which extends upward above the top of the casing, and is provided with a pair of tightening nuts 70 by means of which the valve can be drawn tightly against the tapered wall of the valve chamber, a washer 71 being interposed between the lower nut 70 and a boss 72 at the top of the casing and surrounding the opening through which the shank of the valve extends. The lower end of the valve extends downward below the casing through the larger opening and is provided with a valve handle 73 by means of which the valve can be shifted.

Communicating with the valve chamber directly opposite the inlet opening, is an exhaust passageway 74 and at the top of the casing in line with the main portion of the exhaust opening 74 is a threaded opening

into which is tightly screwed a hollow valve plug 75, the latter resting upon a boss 76 at the top of the casing. The body of the valve plug is also threaded on the exterior and receives an adjustable valve cap 77, the cylindrical wall of which is provided with a number of rows or series of outlet openings 78 through which the motive fluid may exhaust. The valve cap 77 may be raised or lowered so as to increase or decrease the number of openings through which the motive fluid may exhaust, and this device thereby serves as a means for controlling the drill, since the motive fluid can be throttled to any extent desired. To prevent the valve cap 77 being accidentally shifted, the valve plug is provided with a socket which contains a small coil spring 79 and a pin 80 which extends upward into engagement with the top of the valve cap and has a pointed upper end which may take in any one of a series of recesses 81 in the top of the valve cap.

By referring particularly to Fig. 2 it will be seen that cored into the wall of the casing, are two passageways 82 and 83 which extend from the valve chamber 16 along opposite sides of the casing, and that between the passageway 82 and the cylindrical compartments 17 and 18 are a number of ports or passageways 84, and between the passageway 83 on the opposite side of the casing and the compartments 17 and 18 are a number of similar ports or passageways 85. It will also be seen that when the valve is in the position shown in Fig. 2, the motive fluid is shut off from the motor, the valve closing both the inlet opening and the exhaust opening. When however the valve is shifted either to the right or to the left the motive fluid is admitted to one side of the valve and to one of the passageways 82 or 83 depending upon the direction in which the valve is turned and is admitted through the ports to the compartments 17 and 18, said ports being so arranged as to direct the air against the teeth of the rotary gears and the blades carried thereby so as to drive said gears in opposite directions. At the same time that the valve is turned so as to place the inlet pipe 65 in communication with one of the passageways 82 or 83, the other passageway is placed in direct communication with the exhaust passageway 74 and hence with the exhaust openings 78 in the exhaust valve. If the valve 67 is turned in the opposite direction, the passageway between the valve chamber and compartments 17 and 18 which before was the admission passageway will become the outlet passageway, and the passageway which before was the outlet passageway will become the inlet passageway, and the direction of rotation of the motor will be reversed.

At the mouths of the passageways 82 and 83 are arranged gates 90 and 91 respectively

in which are formed openings 92 and 93 respectively and in proximity to said gates are arranged stops 94 and 95 and the arrangement is such that each gate will swing shut under the pressure of the motive fluid entering the passageway at the mouth of which it is mounted but will open under the pressure of the fluid escaping from the passageway. Therefore when the motive fluid is entering either of said passageways it must pass through the small opening in the gate, and therefore the maximum pressure in the cylinders is kept constant, the exhaust remaining the same, regardless of the degree to which the supply valve may be opened and therefore the drill cannot be driven at excessive speed even though the supply valve be carelessly manipulated. Also the small openings in the gates insure a slow and gradual starting of the drill thereby preventing the drill from being broken.

We do not desire to be confined to the exact details shown but aim in our claims to cover all modifications which do not involve a departure from the spirit and scope of our invention.

What we claim is,—

1. In a motor drill, a cylinder, a rotary driving member supported in said cylinder, a tool holder, means connecting said driving member and said tool holder, a passageway for supplying the actuating fluid, a valve for controlling the admission of the actuating fluid to said passageway and a gate arranged in said passageway between the intake to the cylinder and said valve, said gate being provided with an opening, for the purpose set forth.

2. In a motor drill a pair of communicating cylinders, a pair of intermeshing driving gears supported so as to rotate in said cylinders, a tool holder operatively connected with said driving gears, a valve chamber, passageways connecting said valve chamber with opposite sides of the two cylinders, said passageways being provided with gates having openings for the passage of the actuating fluid, each of said gates being arranged to close when the passageway in which it is located is used as an intake passageway, and to open when the passageway is used as an exhaust passageway, an exhaust passageway also connected to said valve chamber, an inlet pipe for supplying an actuating fluid to said valve chamber, a valve arranged in said valve chamber, said valve being so constructed that when turned from its normal closed position it will place one of said passageways which connect said valve chamber and said cylinders in communication with the inlet pipe and the other of said passageways in communication with said exhaust passageway.

3. In a motor drill, a casing, a driving gear therein, said gear having teeth, each of

which is provided with a longitudinal slot and a pair of sockets containing springs, a pair of blades in the slot of each tooth, one of said springs engaging one of the blades so as to press the same in one direction and the other spring engaging the other blade so as to press the same in the opposite direction, a tool holder, means connecting said gear and tool holder and means for supplying a motive fluid to said casing so as to rotate said gear.

4. In a motor drill, a casing, a pair of intermeshing driving gears supported in said casing, said gears having teeth, each of which is provided with a slot extending longitudinally thereof, a pair of outwardly extending blades in the slot of each tooth, a pair of springs also carried by each tooth, one of said springs engaging one of the blades so as to press the same in one direction and the other spring engaging the other blade so as to press the same in the opposite direction, a tool holder, driving means connecting said gears and tool holder, and means for supplying motive fluid to said casing so as to rotate the gears.

5. In a motor drill, a casing, a pair of intermeshing driving gears supported in said casing, each of the teeth of said gears having a slot extending longitudinally thereof and having a pair of sockets, a pair of blades in the slot of each tooth, said blades having shoulders and tongues projecting into said sockets, the adjacent shoulders of the two blades being out of alinement with each other, springs in said sockets, and surrounding the tongues, one of the springs bearing upon the shoulder of one of the blades so as to force the same in one direction and the other spring bearing upon the shoulder of the other blade so as to force the same in the opposite direction, a tool holder, a driving connection between said gears and the tool holder, and means for supplying a motive fluid to said casing so as to rotate the gears.

6. In a motor drill, a casing, a rotary driving member supported in said casing, a valve for supplying a motive fluid to the casing, an exhaust valve having means whereby the area of the exhaust outlet may be adjusted, a tool holder and means connecting said driving member and tool holder.

7. In a motor drill, a casing, a rotary driving member in said casing, a valve for admitting a motive fluid to said casing, an exhaust valve comprising a valve seat and an adjustable valve cap carried thereby, said cap having a plurality of openings through which the exhaust may take place, a tool holder, and means connecting said driving member and tool holder.

8. In a motor drill, a casing, a hollow shaft journaled in the opposite walls of said

casing, a rotary driving member fixed to said shaft, a second shaft journaled in the casing walls and a second driving member fixed to said shaft and engaging the first-named driving member, a feed screw extending into the hollow shaft, a fixed feed member engaging said feed screw, a drill socket, gearing connecting the drill socket and second-mentioned shaft, and means for transmitting the thrust of said drill socket to the feed screw.

9. In a motor drill, a casing, a hollow shaft journaled in the opposite walls thereof, a second shaft likewise journaled in the walls of the casing, said shafts having intermeshing driving gears adapted to be rotated by fluid pressure and said second-mentioned shaft having a pinion, a pair of threaded feed members extending into said hollow shaft and one being fixed with respect thereto, a drill socket having a gear meshing with said pinion, and means for transmitting pressure from said drill socket to said feed members comprising ball bearings and ball races, one of the latter being movable with the drill socket and the other being secured to said fixed feed member.

10. In a motor drill, a casing, a pair of bearing sleeves fixed in the opposite walls of the casing, a hollow shaft journaled in said bearing sleeve, a second pair of bearing sleeves also fixed in the walls of the casing, a second shaft journaled in said last-named bearing sleeves, a pair of intermeshing driving gears adapted to be actuated by fluid pressure mounted on said shafts and said second-named shaft having a pinion fixed thereto, a pair of feed members one fixed and the other movable extending in said hollow shaft, a drill socket having one end extending into one end of said fixed feed

member and having a gear meshing with said pinion, and means for transmitting the pressure from said drill socket to said feed members comprising ball bearings and a pair of ball races, one movable with the drill socket and the other secured to said fixed feed member.

11. In a motor drill, a casing, comprising a main or body portion, a combined cover and gear casing secured thereto, and a cover for said gear casing, a pair of bearing sleeves fixed in the wall of the main portion of said casing and in the wall of the cover therefor, a hollow shaft journaled in said bearing sleeves, bearing sleeves also secured in alignment in the main portion of the casing, in the wall of the gear casing and in the wall of the cover for said gear casing, a second shaft journaled in said last-mentioned bearing sleeves, a pair of intermeshing driving gears adapted to be actuated by fluid pressure mounted on said shafts and said second-named shaft having also a pinion fixed thereto, a pair of feed members one fixed and the other movable extending in said hollow shaft, a drill socket having one end extending into the adjacent end of said fixed feed member and having a gear meshing with said pinion, and means for transmitting pressure from said drill socket to said feed members comprising ball bearings and a pair of ball races one movable with the drill socket and the other secured to said fixed feed member and to the casing wall.

Signed by us at Cleveland, Ohio, this 3rd day of July, 1908.

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