

March 11, 1952

C. T. COLE
PERCUSSION TOOL

2,588,360

Filed June 9, 1950

3 Sheets-Sheet 1

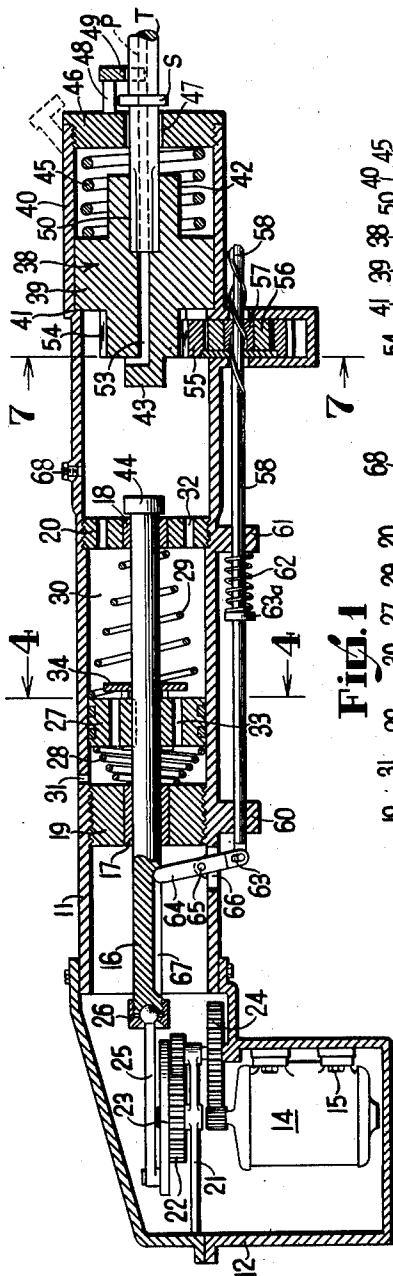


Fig. 1

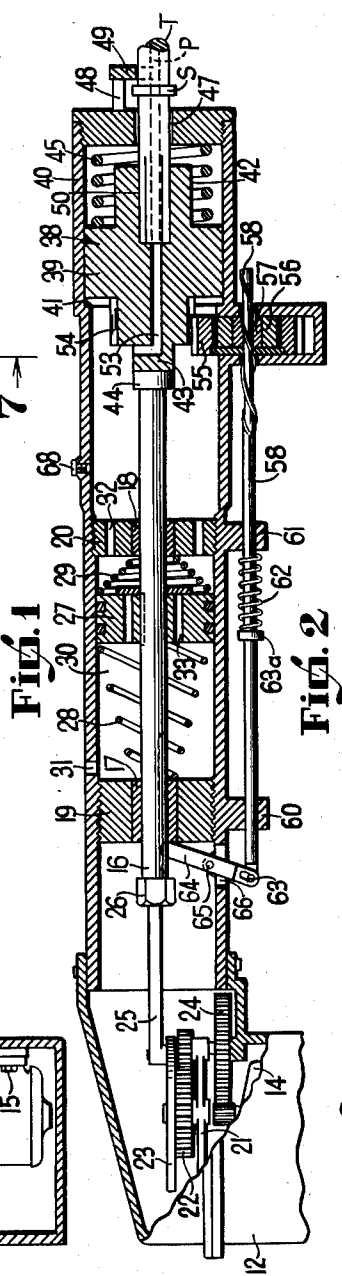


Fig. 2

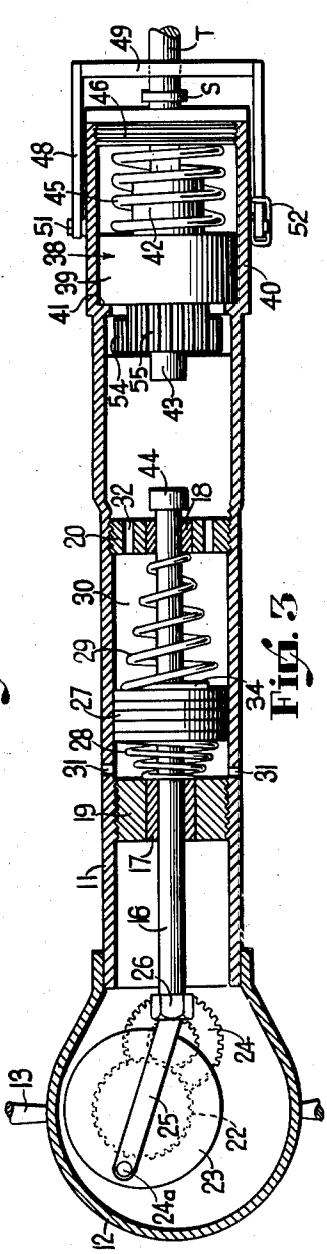


Fig. 3

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3 Sheets-Sheet 2

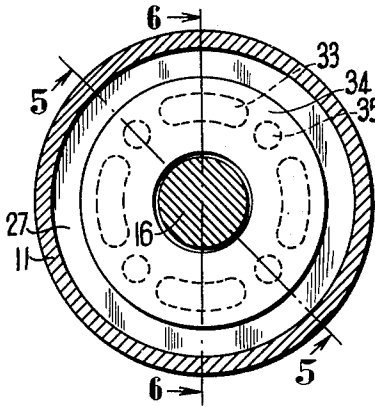


Fig. 4

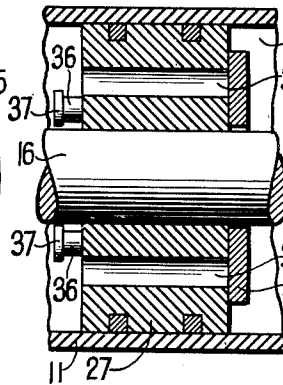


Fig. 5

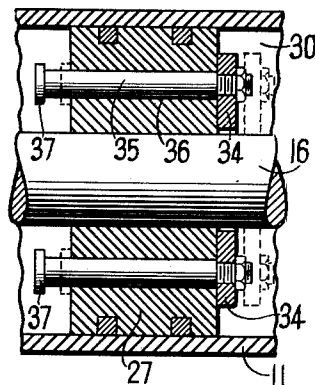


Fig. 6

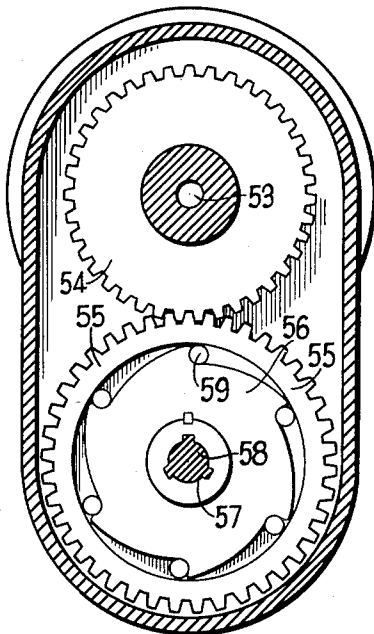


Fig. 7

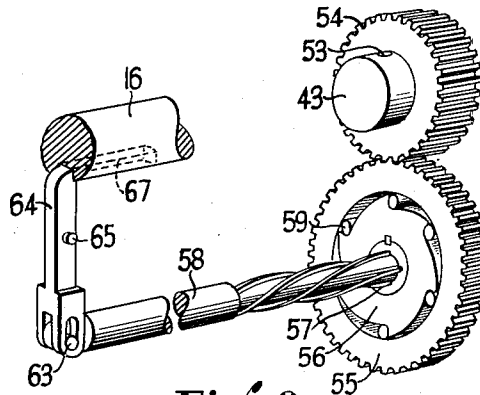


Fig. 8

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3 Sheets-Sheet 3

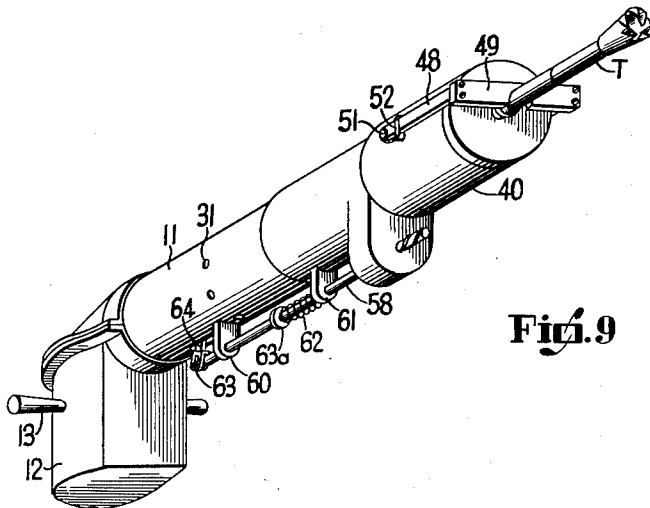


Fig. 9

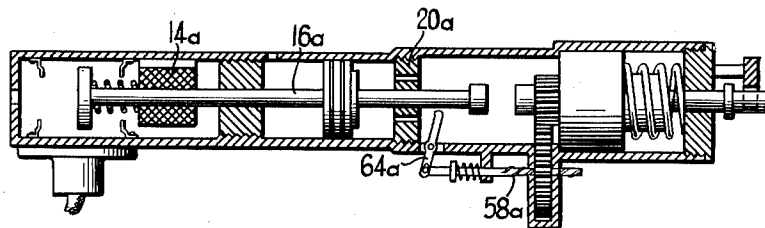


Fig. 10

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2,588,360

PERCUSSION TOOL

Charles T. Cole, New Philadelphia, Ohio

Application June 9, 1950, Serial No. 167,236

9 Claims. (Cl. 255-43)

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My invention relates to a percussion tool. It has to do, more particularly, with a percussion tool or hammer of that general type wherein the hammer or striking member is driven by mechanical means rather than pneumatic means.

One of the objects of my invention is to provide a very simple and inexpensive percussion tool which is of small and compact structure and, therefore, is portable.

Another object of my invention is to provide a percussion tool which is mechanically driven rather than pneumatically driven so that it is not necessary to provide a compressor for operating it.

Still another object of my invention is to provide a percussion tool of the type indicated which is provided with simple means for rotating the tool-receiving chuck thereof after each impact of the hammer.

An additional object of my invention is to provide a percussion tool which is provided with means for compressing air each time the hammer is actuated, the compressed air being directed to the tool-carrying chuck and being useful, for example, in connection with a grill to blow out loosened material from the hole being drilled.

Still another object of my invention is to provide a percussion tool of the type indicated in the preceding paragraph which is provided with an arrangement that may be used to supply liquid to the hole being drilled.

Various other objects will be apparent.

According to my invention, I provide a percussion tool which includes a cylindrical housing having a handle-carrying radial extension at one end thereof. Within the radial extension, I provide a power unit, such as an electric motor or electromagnetic driving means. Within the cylindrical part of the housing, I provide a reciprocable rod or plunger, the forward end of which serves as the hammer or striking element. The rear end of the rod is connected by a crank arrangement to the power element so that it will be reciprocated thereby. The forward end of the rod, that is, the hammer, is adapted to strike an anvil member which is disposed at the forward end of the cylindrical housing. This member carries the tool-receiving chuck. Associated with the rod or plunger within the cylindrical housing is a piston member which is so arranged that it compresses air within the housing each time the rod moves forwardly to cause the hammer to strike the anvil. The compressed air, thus created, is directed through the tool chuck

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and into a drill, for example, to remove loosened material from the drilled hole. Associated with the air compressing means is a water inlet so that water can enter the housing and be forced to the drilling tool when desired. Ratchet mechanism is associated with the anvil for rotating it step by step so that the drill will be rotated to a new position each time the hammer strikes the anvil. This ratchet mechanism is actuated by means of a screw arrangement which is turned in the proper direction as the rod moves it rearwardly after each impact of the hammer by means of a proper actuating connection between the rod and the screw.

The preferred embodiment of my invention is illustrated in the accompanying drawings wherein similar characters of reference designate corresponding parts and wherein:

Figure 1 is a longitudinal vertical sectional view taken through my percussion tool, the plunger and hammer being shown in withdrawn position.

Figure 2 is a view similar to Figure 1 but showing the hammer in anvil-striking position.

Figure 3 is a horizontal sectional view through the structure of Figure 1.

Figure 4 is a transverse sectional view taken on line 4-4 of Figure 1.

Figure 5 is a sectional view taken on line 5-5 of Figure 4.

Figure 6 is a similar view taken on line 6-6 of Figure 4.

Figure 7 is a transverse sectional view taken on line 7-7 of Figure 1.

Figure 8 is a detail, in perspective, of the ratchet means for rotating the anvil and the screw for actuating the ratchet means.

Figure 9 is a perspective view of my tool.

Figure 10 is a vertical sectional view through a modified type of tool.

With reference to the drawings, I have illustrated the general structure of my percussion tool in Figures 1 to 3 and 9. The tool includes the cylindrical housing 11 which is connected at its rear end to a radially extending housing portion 12. As shown in Figure 9, this extension 12 may be provided with outwardly extending handgrips 13 at opposite sides thereof.

Within the extension 12, I provide suitable power means, for example, an electric motor 14, which is bolted at 15 to the sides of the extension. This motor 14 is adapted to reciprocate a rod or plunger 16 which is axially supported within the cylindrical housing portion 11. The rod or plunger 16 is mounted for sliding movement in bushing 17 and 18 disposed at the axis of the

guiding and supporting disc-like members 19 and 20 which are disposed in fixed axially spaced relationship within the portion 11 of the housing.

In order to connect the motor 14 to the rod 16, I provide the crank arrangement illustrated best in Figures 1 to 3. It will be noted that the housing extension 12 is provided with a support 21 which rotatably supports a gear 22 in crank disc 23 which are formed as a combined unit. The gear 22 is driven from the drive shaft of the motor by suitable reducing gearing including the double pinion unit 24 carried by the support 21. Pivoted at an eccentrically disposed point by a pivot pin 24a is one end of the pitman 25. The opposite end of this member 25 is connected by a universal joint 26 to the rear end of the rod 16. Thus, when the crank disc 23 is rotated by the motor 14, the rod 16 is reciprocated axially within the guide members 19 and 20.

Fixed on the rod 16 is a piston 27 which moves with the rod relative to the cylindrical housing 11 between the guide members 19 and 20. A compression spring 28 is provided between member 19 and piston 27. Similarly, a compression spring 29 is provided between the piston 27 and member 20. Thus, when the piston is moved in either direction by means of the crank mechanism one of the springs 28 or 29 is compressed and the other is permitted to expand. These springs serve to cushion the movement of the piston and eliminate the necessity of accurate adjustment of the stroke of the rod 16.

It will be noted that the members 19 and 20 serve to form a cylindrical chamber 30 within housing 11 and between such members. It will be noted that at the rear end of this chamber 30 an air inlet 31 is provided in the wall of housing 11. It will further be noted that the member 20 is provided with a plurality of bores 32 therethrough which serve as air outlets for chamber 30. The piston 27 is provided with a plurality of bores 33 extending therethrough. On the forward side of the piston a valve plate 34 is provided for closing the forward ends of all of these bores 33. It will be noted from Figures 4, 5 and 6, that the valve plate 34 is carried by pins 35 which are mounted for axial movement in bores 33 in the piston 27. The pins 35 will move axially to space the valve plate 34 from the front surface of the piston, as shown by dotted lines in Figure 6, the rear ends of the pins 35 being provided with stops 37 to engage the rear surface of the piston and limit forward movement of plate 34.

The mechanism just described serves as a small compressor for providing a supply of compressed air. During rearward movement of piston 27, the valve plate 34 is unseated and air which has been taken into the rear end of chamber 30 through opening 31 is forced forwardly through openings 33 in the piston to the forward side of the chamber 30. During forward movement of the piston, this air in the forward portion of the chamber 30 is compressed by movement of the piston and the air pressure developed moves the plate 34 rearwardly until it is seated on the front face of the piston. Further forward movement of the piston, further compresses the air, and forces it from chamber 30 through the openings 32 into the forward end of the housing 11. The air is conducted from the forward end of housing 11 in a manner to be described.

At the forward end of the housing 11, an anvil member 38 is rotatably and reciprocally mounted. This member 38 is provided with an en-

larged portion 39 which fits snugly within the enlarged forward end 40 of the housing 11. A stop shoulder 41 on the housing limits inward movement of piston 38. The anvil 38 is provided with a forwardly extending tool-receiving chuck 42 and with a rearwardly extending striking portion 43. The striking portion 43 is adapted to be engaged by the hammer or striking portion 44 on the forward end of the rod 16. A compression spring 45 is provided ahead of the enlarged portion 39 of the anvil in surrounding relationship to the chuck portion 42. This spring 45 engages a cap 46 which is threaded into the forward end of the housing portion 40. The cap 46 is provided with a central opening 47 through which a tool T may extend and may move axially and rotate, this tool, for example, may be a drill. The tool is provided with a shoulder S with which a retaining member 48 may cooperate. This retaining member 48 is provided with a yoke 49 which normally engages the tool and prevents it from dropping from the tool-receiving socket 50 in chuck 42. The retaining member 48 is pivoted at 51 to opposed sides of the housing portion 40 and is normally kept in engagement with the tool T by means of a spring 52 associated with one of the pivots 51.

It will be apparent that upon forward movement of rod 16, the hammer portion 44 will strike portion 43 of the anvil 38. This will drive the anvil 38 forwardly against the action of the spring 45 which will return the anvil to its original position against shoulder 41 immediately after the percussive blow. Obviously, movement of the anvil in this manner produces corresponding percussion on the tool T.

The compressed air which, as previously indicated, is forced from the forward end of chamber 30 is carried through a passageway 53 formed in the anvil and leading to the tool socket 50. The tool is also provided with a passageway P which leads to its tip. Consequently, compressed air will be forced out of the tip of the tool each time a percussive blow is struck on the anvil which carries the tool. This will blow loosened material from the hole being drilled by the tool.

In all drilling operations with a star drill or the like, as is well known, it is desirable to rotate the tool to a new position after each blow on the tool. For this purpose means is provided which is actuated by rearward movement of the rod 16 for rotating the anvil and thus the tool step by step after each blow on the anvil. It will be noted that the rear portion of the anvil has a pinion 54 formed thereon. This pinion is engaged by a gear 55, as shown best in Figures 7 and 8. The gear 55 is disposed for rotation in a radially extension 56 of the housing 11. The gear 55 is mounted concentrically on a ratchet member 56 which is provided with a central opening 57 through which a screw 58 is threaded, this screw extending axially through the housing extension 56 and being rotatable and axially movable in the walls thereof. The ratchet member 56 is operatively connected to the gear 55 by the usual pin and notch arrangement 59 which is the ordinary free wheeling connection. The screw 58 is mounted for sliding movement in longitudinally spaced lugs 60 and 61 carried by the housing 11. A compression spring 62 is provided around the screw 58 between lug 61 and a collar 63a on the screw 58 and serves to keep member 58 in its rearwardmost position. The rear end of the screw 58 is connected by a pin and slot connection 63 to the lower end of a trigger 64 which is pivoted inter-

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mediate its ends at 65 to the wall of housing 11, passing downwardly through a slot 66 in the housing. The upper end of the trigger 64 extends into a longitudinally extending groove 67 formed in the surface of the rod 16.

The spring 62 keeps the rod in the position shown in Figure 1 with the upper end of the trigger 64 at the forward end of the groove 67. As the rod 16 moves forwardly the end of the trigger 64 merely slides in groove 67 until the rear end of the groove is reached. At this time the trigger 64 will be swung forwardly to the position shown in Figure 2, exerting a rearward pull on the screw 58 and causing it to rotate ratchet 56 clockwise thereby producing similar rotation of gear 55. This will rotate the anvil 38 and, consequently, the tool T. As soon as the rod 16 moves rearwardly, the forward end of groove 67 will engage trigger 64 and return the trigger to the position shown in Figure 1. Thus, during each return movement of the rod 16, the tool will be rotated. During the forward movement of the screw 58 the ratchet member 56 is rotated counter clockwise and, therefore, will not rotate gear 55. Since the forward movement of anvil 38 is slight gears 54 and 55 will always be in engagement, merely sliding relatively.

In some cases it may be desirable to supply water or other liquid to the tool instead of merely compressed air. For this purpose the housing 11 is provided beyond the member 20 with a removable tap 68 by means of which a liquid-supplying conduit may be connected to the housing.

In Figure 10, I have illustrated a modification of my device. The structure is almost identical with the exception that the usual solenoid 14a is provided as the power element rather than the electric motor 14. This electromagnetic arrangement will function in the usual manner to reciprocate the rod 16a. In this instance, the trigger 64a which actuates the screw 58a is located forwardly of member 20a and cooperates with the forward end of rod 16a. However, this mechanism functions practically the same as before.

It will be apparent from the above description that I have provided a percussion tool having a number of advantages. The tool is relatively simple and inexpensive to manufacture. Since it is mechanically driven and since it produces its own air supply for blowing out the drilled hole, no hose connections to a compressor are required. Effective and simple means is provided for rotating the tool after each percussive blow.

Various other advantages will be apparent.

Having thus described my invention, what I claim is:

1. A percussion tool comprising a cylindrical housing, a tool-carrying anvil mounted at the forward end of said housing for axial movement, a rod within said housing mounted for axial movement in axially spaced guide members disposed within the housing behind said anvil, a hammer portion on the forward end of said rod

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being adapted to strike a striking portion on the rear end of said anvil, a chamber being formed between said rod guide members, a piston carried by said rod between said guide members, said chamber being provided with an air inlet through the wall of the housing behind said piston and an air outlet through the forwardmost guide member, said piston being provided with an air passageway extending therethrough, and a one way valve for controlling said air passageway, said valve closing automatically upon forward movement of the piston and opening automatically upon rearward movement of the piston, said anvil being provided with an air conducting passageway extending therethrough for conducting air to a tool carried thereby.

2. A percussion tool according to claim 1 wherein said valve comprises a plate carried by pins extending axially through said piston and having the plate on one end thereof and stop means on the other end thereof for limiting movement of the plate.

3. A tool according to claim 2 wherein a compression spring is provided between each of said rod guide members and the corresponding face of the piston.

4. A tool according to claim 3 wherein mechanical means is provided within the housing for reciprocating the rod.

5. A tool according to claim 4 wherein said mechanical means includes an electric motor and crank mechanism connecting said motor to said rod.

6. A tool according to claim 4 wherein said mechanical means is operated electromagnetically.

7. A tool according to claim 3 wherein a compression spring is provided ahead of the anvil for resisting forward movement thereof.

8. A tool according to claim 1 wherein said anvil is also mounted in the housing for rotating movement and wherein means is provided for rotating said anvil upon rearward movement of the rod, said means comprising a screw carried by the housing for axial movement, a trigger connected to the screw and moved by engagement with the rod upon rearward movement thereof, and ratchet means connecting said screw to said anvil.

9. A tool according to claim 8 wherein said ratchet means comprises a free wheeling drive between said screw and anvil, said free wheeling drive comprising an actuating member through which said screw is threaded.

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The following references are of record in the file of this patent:

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