Aug. 14, 1945. W. H. WARREN 2,382,591

COMPRESSED AIR-OPERATED ROTARY TOOL

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Fig. 1

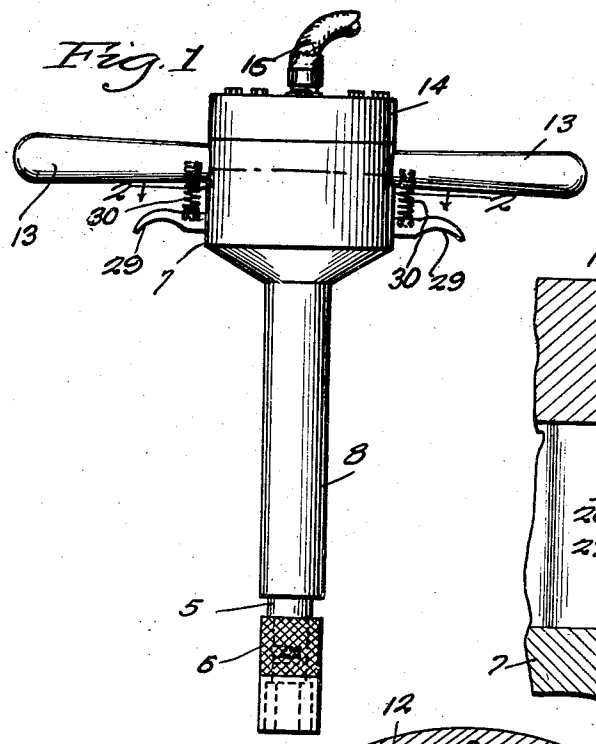

Fig. 3

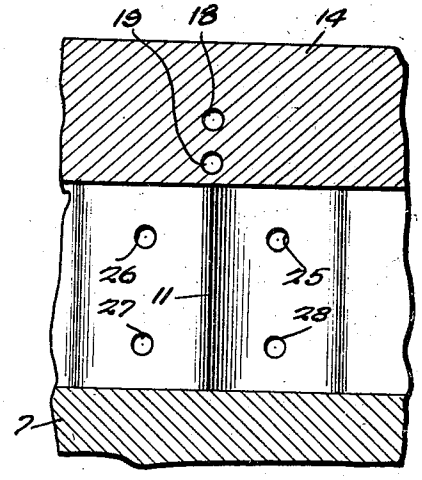

Fig. 2

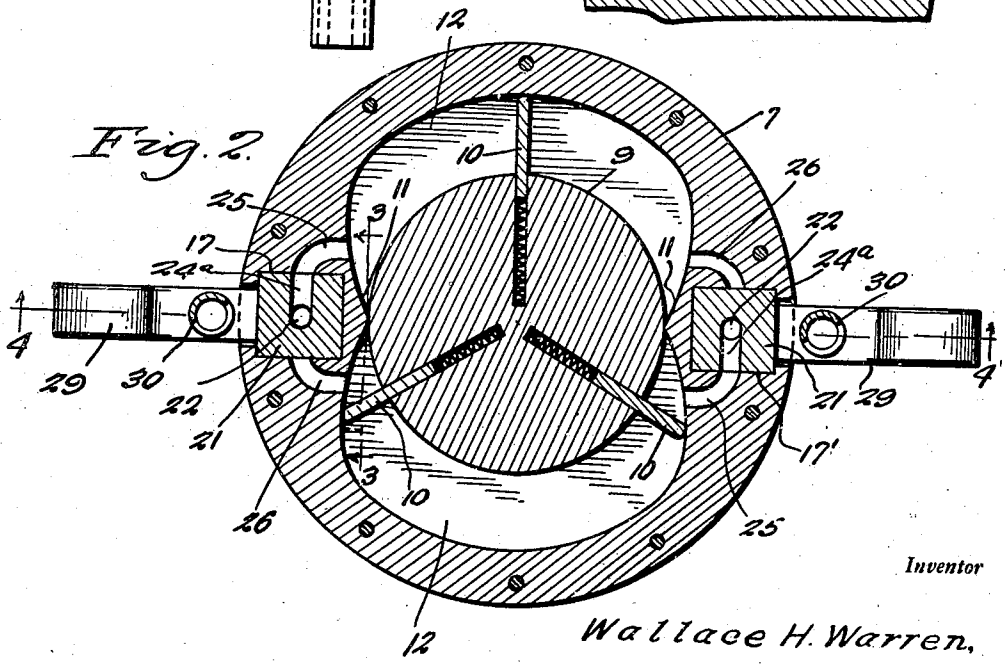

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Fig. 4

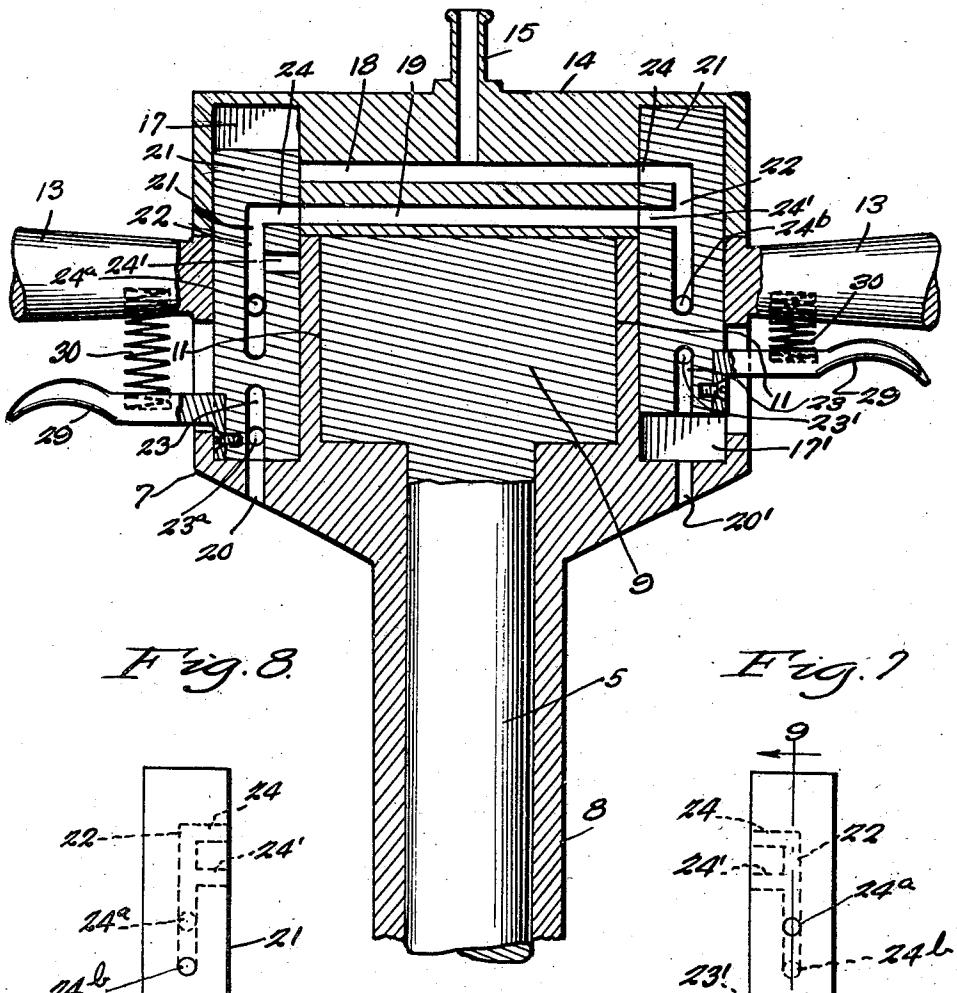

Fig. 8.

Fig. 7

Fig. 9

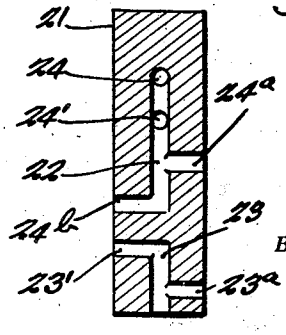

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Fig. 5.

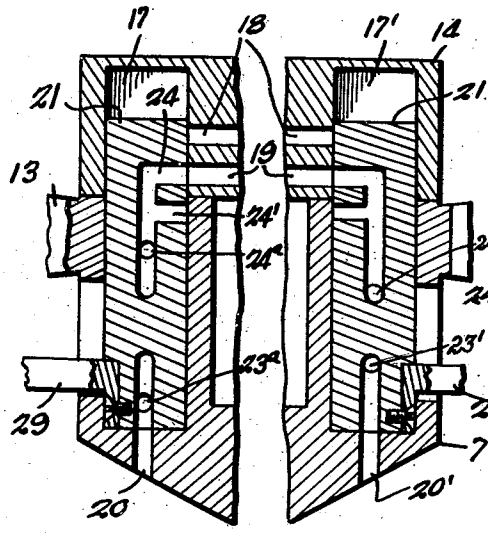


Fig. 6.

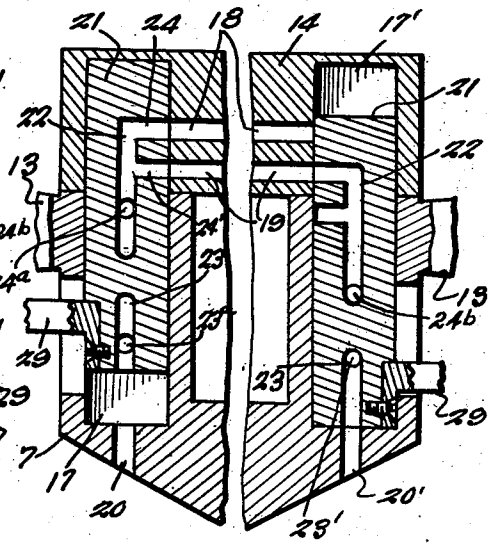
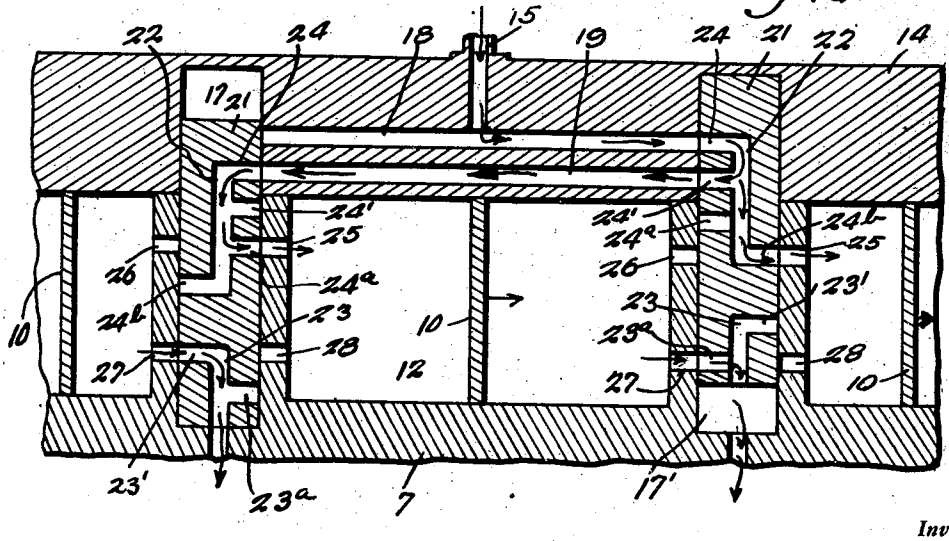


Fig. 10.



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UNITED STATES PATENT OFFICE

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COMPRESSED AIR OPERATED ROTARY TOOL

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Application December 27, 1944, Serial No. 569,970

3 Claims. (Cl. 121—34)

This invention relates to an improved rotary tool of the type embodying a work-driving member and a reversible compressed air-operated motor for actuating said work-driving member.

The primary object of the invention is to provide a tool of the above kind including a novel valve arrangement by means of which the operation and direction of rotation of the motor may be readily and conveniently controlled.

More specifically, the present invention contemplates a tool of the above kind in which the motor cylinder is provided with laterally projecting handles at opposite sides thereof, and wherein the operation and direction of rotation of the motor is controlled by vertically slidable valves mounted in the motor cylinder at opposite sides of the latter and provided with laterally projecting actuating finger-pieces located directly beneath the respective handles, the valves being normally yieldingly moved to lowered position, and the arrangement being such that when one valve is elevated the piston of the motor will be driven in one direction and when the other valve is elevated the piston will be driven in the opposite direction. Due to the relative arrangement of the handles and the finger-grips of the valves, the latter are adapted for convenient actuation by fingers of the operator's hands gripping the respective handles while maintaining a firm grip on the latter and by a natural gripping action in which the finger-pieces are pressed upwardly toward the handles.

Other objects and features of the invention will become apparent from the following description when considered in connection with the accompanying drawings, and the invention consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the drawings and claimed.

In the drawings, wherein like reference characters indicate corresponding parts throughout the several views:

Figure 1 is a side elevational view of a rotary tool embodying the present invention.

Figure 2 is an enlarged horizontal section taken on line 2—2 of Figure 1.

Figure 3 is an enlarged fragmentary vertical section taken on line 3—3 of Figure 2.

Figure 4 is a fragmentary vertical section taken substantially on the plane of line 4—4 of Figure 2, but with one of the valves in raised position.

Figure 5 is a view somewhat similar to Figure 4, partly broken away, illustrating both of the valves in their normal lowered positions.

Figure 6 is a view similar to Figure 5, with one of the valves in raised position, the raised valve being that which is lowered in Figure 4.

Figure 7 is a side elevational view of one of the valves.

Figure 8 is a view looking at the opposite side of the valve shown in Figure 7.

Figure 9 is a vertical section taken on line 9—9 of Figure 7.

Figure 10 is a diagrammatic view more clearly illustrating the arrangement of ports and passages and how they are controlled by the valves.

Referring in detail to the drawings, the present tool includes a rotary shank 5 having a work-driving member 6 on the lower end thereof. As shown, this work-driving member is in the form of a wrench socket detachably applied to the lower end of the shank 5 in a manner well known in the art of socket wrenches, so as to permit the interchangeable use of sockets of various kinds and sizes. With this arrangement, the invention will provide a power-operated speed wrench, but it will be apparent that a chuck, screw driver bit, or the like, may be substituted for the wrench socket 6, depending upon the type of tool desired.

The invention further includes a rotary compressed air-operated motor having a cylinder 7 formed with a central depending housing 8 in which the shank 5 is rotatably fitted. The motor is preferably of the reversible type including a rotary piston composed of a cylindrical rotor 9 provided with a plurality of spring-projected radially movable peripheral vanes 10 slidably mounted in radial slots of the rotor 9. At diametrically opposite sides, the cylinder 7 is internally thickened to provide opposed abutments 11 which contact the periphery of the rotor 9 and which divide the cylinder into opposed pressure chambers 12. The abutments are provided at opposite sides with cam surfaces engaged by the outer ends of the vanes 10 so that the latter are caused to recede in passing the abutments 11. The cylinder 7 is provided at opposite sides with laterally projecting elongated handles 13 adapted to be held for maintaining engagement of the tool-driving member 6 with the work when the tool is in operation.

The compressed air-operated motor is of the reversible type in which air under pressure is simultaneously admitted to corresponding ends of the chambers 12 and simultaneously exhausted from the opposite ends of the latter. The cylinder 7 preferably has a removable head 14 at its upper end that is provided with a central compressed air inlet nipple 15 to which the compressed air is supplied by a hose 16 from a suitable source. The thicker portions of the walls of cylinder 7

adjacent the abutments 11 and handles 13 are formed with vertical valve chambers 17 and 17', and the head 14 is provided with upper and lower diametric passages 18 and 19 providing communication between the upper ends of the chambers 17 and 17', the passage 18 also communicating intermediate its ends with the inlet nipple 15. Exhaust ports 20 and 20' are provided in the bottom of the cylinder 7 to place the lower ends of the valve chambers in communication with the atmosphere. Each of the chambers 17 and 17' has a similar vertically slidable valve member 21 fitted therein. These valves are of similar form and each includes an air inlet passage 22 and an exhaust passage 23. The inlet passage 22 is provided with branches 24 and 24' that may simultaneously register with the passages 18 and 19 when the valve is raised, the branch 24 being registered with the passage 19 when the valve is lowered. The inlet passage 22 of each valve also has a further branch 24*a* arranged to communicate with an intake port 25 provided in one side of the adjacent abutment 11, when the valve is lowered. The passage 22 has a still further branch 24*b* arranged to register with an intake port 26 provided through the opposite side of the adjacent abutment 11 when the valve is raised. Also, the exhaust passage 23 of each valve is provided in the lower portion of the latter and opens through the lower end of the same in constant communication with the associated exhaust port 20 or 20' of the cylinder 7. Passage 23 is provided with a branch 23' adapted to register with an exhaust port 27 provided in the second-mentioned side of the associated abutment 11, when the valve is lowered. Passage 23 is provided with a further branch 23*a* adapted to register with an exhaust port 28 provided in the first-mentioned side of the associated abutment 11, when the valve is raised. The arrangement is such that when both valves are lowered, as shown in Figure 5, the ends of passage 18 are closed and the motor is inoperative. In order to drive the piston in one direction, valve 21 of chamber 17 is allowed to remain in lowered position and valve 21 of chamber 17' is raised, as shown in Figure 4 and diagrammatically illustrated in Figure 10. When this is done, the compressed air passes from passage 18 into passage 22 of the valve in chamber 17', and from said passage 22 through branch 24*b* and adjacent port 25 into the adjacent end of one pressure chamber 12 behind a vane 10. At the same time, the compressed air flows from the passage 22 of the valve in chamber 17' through its branch 24' and passage 19 into the passage 22 of the valve in chamber 17 through its branch 24. From the passage 22 of the valve in chamber 17, the air passes through the branch 24*a* of the latter valve and port 25 of the adjacent abutment 11 into the adjacent end of the other chamber 12 and behind another vane 10. This causes driving of the piston in the desired direction with pressure simultaneously acting upon two of the vanes in the respective chambers 12. At the same time, the exhaust passage 23 of the valve in chamber 17 has its branch 23*a* registered with the exhaust port 27 of the adjacent abutment 11, and the passage 23 of the valve in chamber 17 has its branch 23' registered with the exhaust port 27 in the other abutment 11 so as to permit the air in front of the vanes to exhaust from the chambers 12 to the atmosphere so as to not interfere with the driving of the piston. To reverse the direction of rotation of the piston, the valve 21 in the chamber 17' is permitted to lower and the valve in the chamber 17 is raised, as illustrated in Figure 6. When this is done, the air passes from passage 18 into the passage 22 of the valve in chamber 17 through its branch 24, and the air passes from this passage 22 through the intake port 26 of the adjacent abutment 11 through the branch 24*b* of said passage 22. At the same time, the air passes from the passage 22 of the valve in chamber 17 through its branch 24' into passage 19 and then into the passage 22 of the valve in chamber 17' through its branch 24. From the passage 22 of the valve in chamber 17', the air passes through the branch 24*a* of the latter passage 22 and the adjacent port 26 of the adjacent abutment. In this way, compressed air is admitted into the chambers 12 at the opposite ends of the latter from that first described so that the piston is driven in the opposite direction. With the valve in chamber 17 raised, its passage 23 communicates with the exhaust port 28 of the adjacent abutment through its branch 23*a*, while the exhaust passage 23 of the valve in chamber 17' communicates with the exhaust port 28 of the adjacent abutment through the branch 23' of said passage 23 of the valve in chamber 17'. Thus, air is exhausted from the chambers 12 in front of the vanes to permit free driving of the piston in the reverse direction.

It will be seen that the motor is inoperative when both valves are lowered, that the piston will be driven in one direction when one valve is raised and the other is allowed to remain in lowered position and that the piston will be driven in the opposite direction when said other valve is raised and the first-named valve is allowed to remain in lowered position. In this way, only one valve need be raised to effect driving of the piston in the desired direction. Thus, the operator may readily select the direction of rotation of the work-driving member by selecting the particular valve to be raised.

The valves 21 are preferably provided with laterally projecting finger-grips 29 that are disposed directly below the inner ends of the handles 13, and compression springs 30 are suitably provided for normally yieldingly positioning the valves in lowered position. The finger-grips 29 are thus within convenient reach of the fingers of the hands gripping the handles 13, and raising of the desired valve may be had by natural squeezing or gripping pressure of the required hand which effects upward movement of the finger-grip 29 of the valve to be raised. Thus, actuation of the desired valve may be had by the operator while retaining a firm grip upon the handles 13. A desired valve may be readily and quickly raised so as to place the tool in operation with a minimum effort and loss of time.

From the foregoing description, it is believed that the construction and operation, as well as the advantages of the present invention, will be readily understood and appreciated by those skilled in the art. It will be seen that I have provided a comparatively simple and compact construction which may be economically manufactured and which is exceedingly convenient to use. Minor changes may be made in details of construction illustrated and described, such as fairly fall within the spirit and scope of the invention as claimed.

What I claim is:

1. A compressed air-operated rotary tool comprising a reversible rotary compressed air-operated motor, said motor comprising a vertical cylinder having handles projecting from opposite

sides thereof, a rotary piston in said cylinder having a rigid depending axial shank, normally lowered vertically slidable valves at opposite sides of said cylinder for controlling admission and exhaust of air to and from the same, said cylinder and valves having coacting inlet and exhaust passages and ports whereby raising of one valve will effect driving of the piston in one direction and raising of the other valve will effect driving of the piston in the opposite direction, finger-grips projecting laterally from said valves beneath the respective handles and operable by fingers of the hands gripping said handles to selectively raise the valves, and a work-driving member on the lower end of said shank.

2. A compressed air-operated rotary tool comprising a reversible rotary compressed air-operated motor, said motor comprising a vertical cylinder having handles projecting from opposite sides thereof, a rotary piston in said cylinder having a rigid depending axial shank, normally lowered vertically slidable valves at opposite sides of said cylinder for controlling admission and exhaust of air to and from the same, said cylinder and valves having coacting inlet and exhaust passages and ports whereby raising of one valve will effect driving of the piston in one direction and raising of the other valve will effect driving of the piston in the opposite direction, finger-grips projecting laterally from said valves beneath the respective handles and operable by fingers of the hands gripping said handles to selectively raise the valves, and a work-driving member on the lower end of said shank, said piston comprising a rotor having radially slidably spring-projected vanes, said cylinder having opposed abutments contacting the periphery of the rotor and dividing the cylinder into opposed pressure chambers, the passages and ports providing for simultaneous admission of compressed air to corresponding ends of the pressure chambers and simultaneous exhaust of air from the opposite ends of the pressure chambers when the piston is driven in either direction, said vanes being arranged so that pressure simultaneously acts upon vanes in both pressure chambers in driving the piston.

3. A compressed air-operated rotary tool comprising a reversible rotary compressed air-operated motor, said motor comprising a vertical cylinder having handles projecting from opposite sides thereof, a rotary piston in said cylinder having a rigid depending axial shank, normally lowered vertically slidable valves at opposite sides of said cylinder for controlling admission and exhaust of air to and from the same, said cylinder and valves having coacting inlet and exhaust passages and ports whereby raising of one valve will effect driving of the piston in one direction and raising of the other valve will effect driving of the piston in the opposite direction, finger-grips projecting laterally from said valves beneath the respective handles and operable by fingers of the hands gripping said handles to selectively raise the valves, and a work-driving member on the lower end of said shank, and compression springs acting to normally lower said valves, said work-driving member comprising a wrench socket attachably mounted on the lower end of the shank.

WALLACE H. WARREN.