

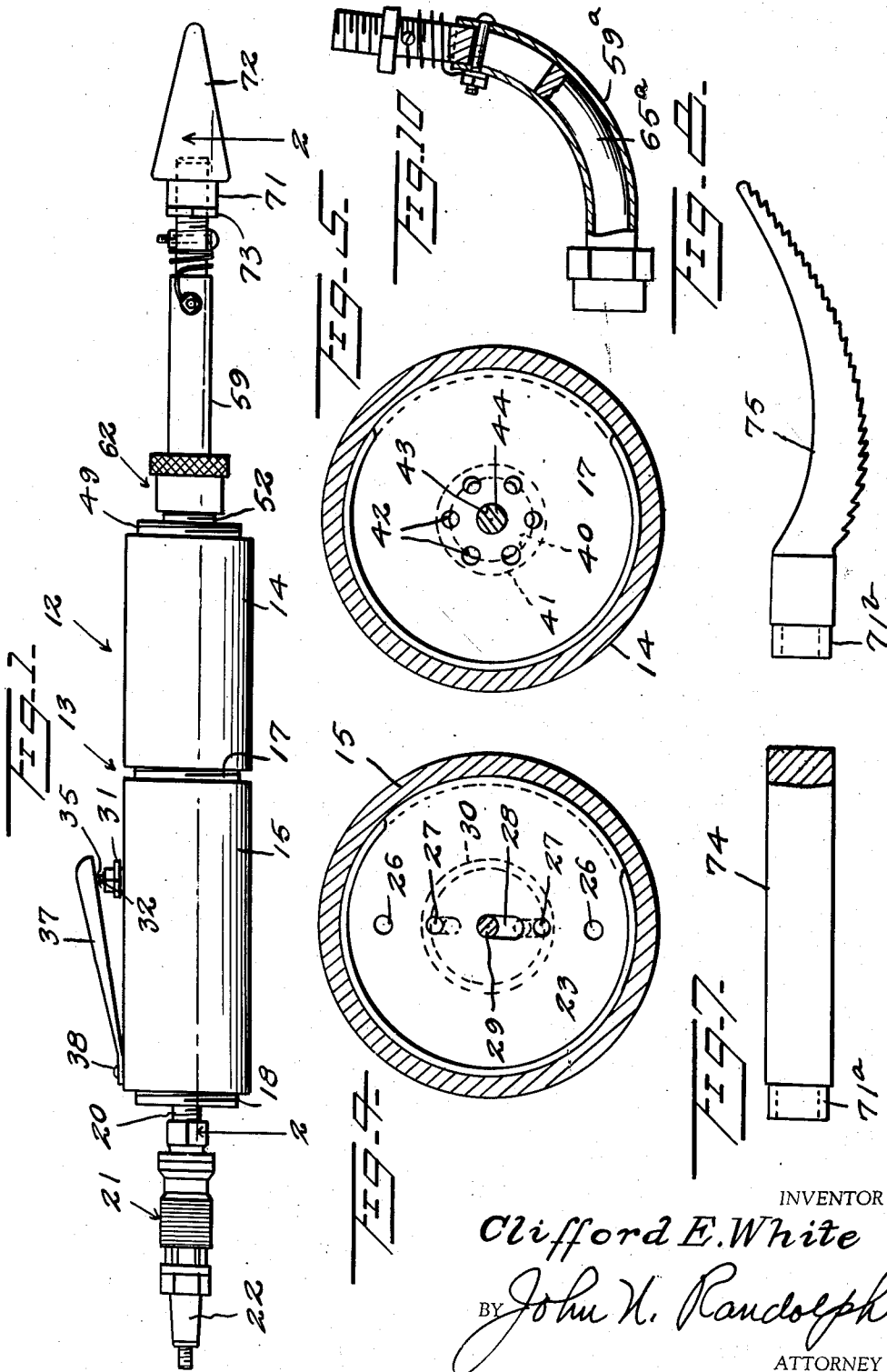
Feb. 9, 1954

C. E. WHITE
PNEUMATIC IMPACT TOOL

2,668,518

Filed Dec. 8, 1952

2 Sheets-Sheet 1



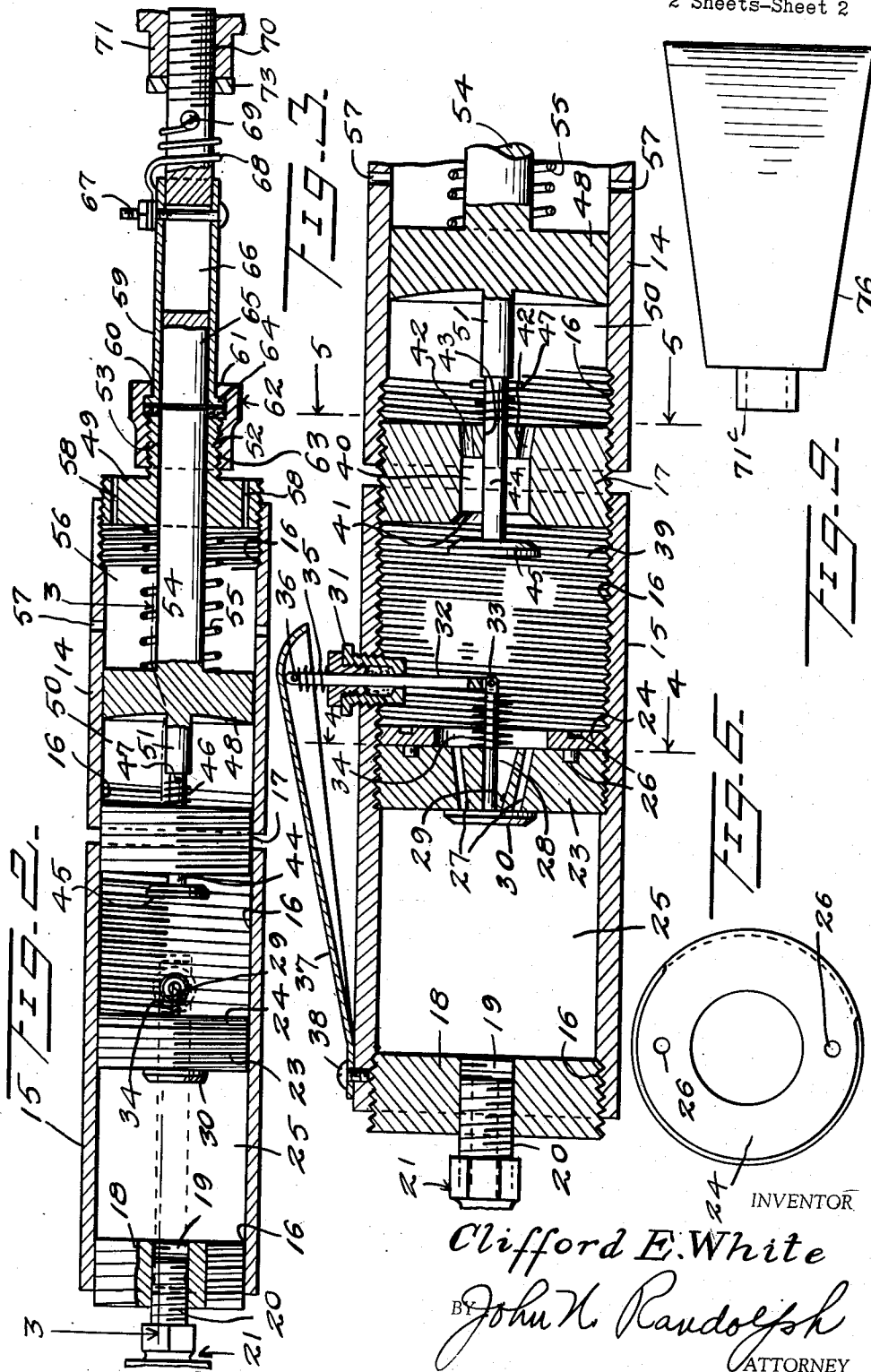
Feb. 9, 1954

C. E. WHITE
PNEUMATIC IMPACT TOOL

2,668,518

Filed Dec. 8, 1952

2 Sheets-Sheet 2



INVENTOR
Clifford E. White
BY John H. Randolph
ATTORNEY

UNITED STATES PATENT OFFICE

2,668,518

PNEUMATIC IMPACT TOOL

Clifford E. White, Belton, Tex.

Application December 8, 1952, Serial No. 324,787

8 Claims. (Cl. 121—30)

1

This invention relates to a pneumatic type impact tool of extremely simple construction adapted to be manually supported in one hand and controlled by a gripping action of the hand which supports the tool for admitting air under pressure to a plunger element whereby a driving force is imparted to an impact head, constituting an end of the tool.

Still another object of the invention is to provide a novel pneumatic type impact tool whereby a series of impact blows may be imparted by the tool in rapid succession and automatically by merely maintaining a manually controlled part in an open or operative position.

Another object of the invention is to provide a portable pneumatic type impact tool which may be readily attached to any suitable source of air under pressure and which is adapted to detachably support various heads or bits to be operated by the tool for accomplishing various types of work.

Still another object of the invention is to provide an impact tool which is capable of supporting a bit or impact head in various positions relatively to the axis of the tool and so that the impact force imparted to the head or bit may be along a line axially of the tool or at various angles to the axis of the tool, to adapt the tool for use in confined spaces, as for example between metal panels of a vehicle body or in other locations where a straight thrust may not be imparted to a tool head or bit.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, illustrating a presently preferred embodiment thereof, and wherein:

Figure 1 is a side elevational view of the pneumatic impact tool;

Figure 2 is an enlarged longitudinal sectional view taken substantially along a plane as indicated by the line 2—2 of Figure 1;

Figure 3 is an enlarged longitudinal sectional view taken substantially along a plane as indicated by the line 3—3 of Figure 2;

Figures 4 and 5 are enlarged cross sectional views of the tool taken substantially along planes as indicated by the lines 4—4 and 5—5, respectively of Figure 3;

Figure 6 is a plan view of one element of the tool;

Figure 7 is a plan view of one form of detachable head, shown partly in section, for use with the impact tool;

Figure 8 is a side elevational view of another form of impact head or bit;

2

Figure 9 is a plan view of another form of head or impact bit, and

Figure 10 is a fragmentary side elevational view, partly in section, illustrating a slight modification of the tool.

Referring more specifically to the drawings, the pneumatic-type impact tool in its entirety is designated generally 12 and includes a barrel 13 formed of a forward cylinder section 14 and a rear sleeve section 15, both of which sections are internally threaded adjacent the ends thereof, as indicated at 16 in Figures 2 and 3. Adjacent inner ends of the sections 14 and 15 are connected by an externally threaded coupling disk 17 onto which the inner ends of the sections 14 and 15 are threaded, as clearly illustrated in Figures 2 and 3. The opposite, outer end of the sleeve section 15, constituting the rear end of the barrel 12 is closed by an externally threaded disk 18, constituting the rear end wall of the barrel 12. The disk 18 has a threaded opening 19 extending therethrough and forming the inlet of the tool 12 into which is threaded the outlet nipple 20 of a suitable air hose or conduit fitting 21 which is adapted to be connected to any suitable source of air under pressure as by means of an air hose, not shown, an outlet end of which is attached to the opposite, inlet end 22 of the fitting 21.

An externally threaded relatively thick disk forming a partition 23 is threaded into the inner end of the sleeve section 15, before said sections are connected by the coupling disk 17 and is positioned approximately intermediate of the ends of the sleeve section 15. An externally threaded washer or ring 24 is threaded into the inner end of the sleeve member 15 and against a side of the partition member 23 and functions as a lock nut to retain said partition member in an adjusted position. The partition member 23 combines with the end wall 18 to form an air chamber 25 therebetween and within the sleeve section 15. The sides of the partition member 23 and the washer 24 which face toward the inner end of the sleeve section 15, are provided with circumferentially or diametrically spaced recesses 26 for receiving a suitable turning tool to apply said parts to or remove said parts from the sleeve section 15. The partition 23 is provided with two spaced passages 27 extending therethrough and is also provided with a tapered bore 28 located between the passages 27 and which tapers toward the chamber 25 for loosely receiving therein a stem 29 of a disk-like valve 30 which is disposed in the air chamber 25 and

which normally closes the ends of the passages 27 which open into the chamber 25.

A stuffing box 31 is detachably mounted in the sleeve section 15 between its inner end and the washer 24 and an actuating rod 32 extends slidably through the stuffing box 31 and radially into the sleeve 15 between the partition wall 23 and the coupling 17. The inner end of the rod 32 is pivotally connected at 33 to the end of the valve stem 29 which is located remote to the valve 30. An expansion spring 34 is disposed on the valve stem 29 and bears against the partition 23 and rod 32 to maintain the valve 30 seated against the partition wall 23 to close the passages 27. An expansion spring 35 is mounted on the outer end of the rod 32 between the stuffing box 31 and a spring stop 36 which extends transversely from the rod 32, for urging the rod outwardly of the sleeve section 15 to position the stem 29 against the straight portion of the bore 28 so that the valve 30 will seat flush against the side of the partition 23. A resilient handle 37 is disposed longitudinally of the sleeve section 15 and has one end thereof secured by a fastening 38 to the rear end of the sleeve section. The resilient handle 37 extends forwardly from its secured end in diverging relationship to the sleeve section. The handle 37 has a concave underside into which the outer end of the rod 32 extends and against which the rod bears, adjacent the free end of the handle. The handle 37 is spring biased away from the sleeve section 15 but when gripped with the sleeve section may be displaced toward the sleeve section by a gripping action to displace the rod 32 inwardly of the sleeve section 15 to rock the stem 29 and valve 30 clockwise as seen in Figure 3, so that the upper edge portion of the valve 30 will fulcrum on the partition 23 to expose the passages 27 so that air may escape there-through from the chamber 25 to the air chamber 39 of the sleeve section 15 and which is located between the partition 23 and the coupling 17. When the gripping pressure is released from the handle 37 the spring 35 will displace the rod 32 outwardly and the spring 34 will return the valve 30 to its closed position of Figure 3 against the partition 23 to close the air passages 27 between the air chambers 25 and 39.

The coupling disk 17 is provided with a bore 40 having a flared end 41 opening into the air chamber 39 and forming a valve seat. The bore 40 at its opposite end is provided with a plurality of restricted passages 42 which open into the cylinder section 14 and which surround a larger central opening 43 which forms a guide for a valve stem 44 which projects from a valve 45 loosely through the bore 40 and slidably through the opening or bore portion 43. Said valve 45 is disposed in the chamber 39 and seats in the valve seat 41 for closing the bore 40. An expansion coil spring 46 is disposed on the opposite end of the valve stem 44 within the cylinder section 14 and bears with one end against the coupling disk 17 and has its opposite end bearing against a spring stop 47 which projects laterally from and is anchored to the valve stem 44.

A piston 48 is slidably disposed in the cylinder section 14 between the coupling member 17 and an externally threaded disk 49, which disk 49 threadedly engages in the outer internally threaded end 16 of the cylinder section 14 and forms the front wall of the tool barrel or body 13. The piston 48 has a close fitting sliding engagement in the cylinder section 14 and com-

bines with the coupling disk 17 to form an expansion chamber 50 therebetween and within the cylinder section 14. Thus, the coupling disk 17 forms a second partition separating the intermediate chamber 39 from the expansion chamber 50. A stem 51 is fixed to and projects perpendicularly from the piston 48 and toward the valve stem 44. The front wall disk 49 is provided on its outer side with a threaded boss 52 and said disk 49 has a central bore extending there-through and through said boss, designated 53. A piston rod 54 extends from the opposite side of the piston or plunger 48 and slidably through the bore 53 and has an expansion coil spring 55 disposed thereon and bearing with one end against the front wall 49 and with its opposite end against the piston or plunger 48. The spring 55 is stronger than the spring 46 and therefore normally displaces the plunger or piston 48 to its position of Figures 2 and 3 and in which the stem 51 bears against the valve stem 44 to compress the spring 46 and hold the valve 45 in an open position. A forward chamber 56 of the cylinder section 14, in which the spring 55 is disposed and which is located between the piston or plunger 48 and end wall 49, is provided with vent ports 57 spaced a substantial distance from the front wall 49 and also from the normal position of the piston or plunger 48, as illustrated in Figures 2 and 3. The front wall 49 is provided with a plurality of vent ports 58 for venting the front chamber 56 when the vent ports 57 are closed by the plunger 48 or are in communication with the expansion chamber 50.

A guide sleeve 59 extends through an opening 60 in an end wall 61 of a cap-like coupling nut 62, the opposite end of which is externally threaded as seen at 63 to engage the boss 52. The guide sleeve 59 has a flanged end 64 which abuts against the inner side of the wall 61 around the opening 60 to retain an end of the sleeve 59 in engagement with the nut 62, by which said sleeve is supported as an extension of the boss 52. Likewise, the bore of the sleeve 59 is of the same diameter as and registers with the bore 53. A tool supporting rod 65 is reciprocally disposed in the guide sleeve 59 and projects from the outer opposite end of said sleeve. The rod 65 has an elongated slot 66 adjacent its inner end through which extends the shank of a bolt and nut fastening 67 which extends diametrically through the sleeve 59, near the outer end thereof and which is normally disposed adjacent the outer end of the slot 66, as seen in Figure 2. A contractile coil spring 68 is wound about a portion of the rod 65 beyond the outer end of the sleeve 59 and is anchored to the rod by a fastening 69 at one end thereof. The opposite end of the spring 68 is secured to the fastening 67. The distal end of the rod 65, beyond the fastenings 69, is threaded as seen at 70 to threadedly engage in an internally threaded socket 71 of an impact head 72. A jamb nut 73 is preferably threaded on the rod end 70 and is placed against the socket end 71 to retain the impact head 72 in an applied position. The impact head 72 as illustrated in Figure 1 is intended for straightening small dents in metal and it will be obvious that impact heads of various sizes and shapes may be interchangeably employed on the tool supporting rod 65. Likewise, other suitable tools may be utilized, each of which is provided with an inner end defined by an internally threaded socket, corresponding to the socket 71, as for example a riveting head

5

74, as illustrated in Figure 7 having a socket 71a; a file head 75 having a socket 71b, as illustrated in Figure 8, and a paint chipping blade 76 having a socket 71c, as illustrated in Figure 9.

The guide sleeve 59 and rod 65 are shown as being straight in Figures 1 and 2. However, for working in close places a curved guide sleeve 59a and a curved tool supporting rod 65a may be substituted for the sleeve 59 and rod 65, as illustrated in Figure 10. Obviously, the extent that the parts 59a and 65a are curved may be varied from substantially the maximum as illustrated in Figure 10 to only a slight curve. It will be obvious that the tool 12 with the parts 59a and 65a substituted for the parts 59 and 65 may be utilized in close places where the straight parts of Figure 1 could not be employed, as for example, between metal panels where the available space was limited or between metal parts and other adjacent members as frequently occur for example in automobile bodies where considerable difficulty is encountered in straightening dents because of the lack of available space when striking an impact blow against an indentation. As the other parts as disclosed in Figure 10 correspond to the parts as illustrated in Figures 1 and 2 and previously described, a further description thereof is considered unnecessary.

Assuming that the impact tool 12 is assembled as illustrated in Figures 1 and 2 and that the fitting end 22 is connected to a source of air under pressure as by being attached to a suitable hose or conduit, not shown, air from the source of supply under pressure will pass through the fitting 21 into the rear chamber 25. When it is desired to operate the tool 12, the hand of the operator which grasps the sleeve portion 15 for supporting the tool is operated by a gripping action to displace the handle 37 toward the sleeve 15 to thus displace the rod 32 inwardly of the sleeve, as previously described, to rock the valve 30 to an open position so that the air under pressure may enter the intermediate air chamber 39 through the passages 27. As the valve 45 will then be held in an open position by the spring 55, the compressed air will flow from the intermediate chamber 39 into the expansion chamber 50 through the bore 40 and its passages 42, and when a sufficient air pressure has been built up in the expansion chamber 50, which will occur almost instantly, the piston or plunger 48 will be displaced forcibly toward the front wall 49 thus driving the plunger rod 54 forcibly into the sleeve 59 to project the tool supporting rod 65 forcibly in a direction outwardly of the sleeve 59 or from left to right as seen in Figures 1 and 2, thus imparting a sudden impact or power stroke to the impact head, blade or bit mounted on the rod end 70. As the plunger or piston 48 moves from left to right (Figures 1 and 2 and Figures 2 and 3) the stem 51 disengages the valve stem 44 so that the spring 46 moves the valve 45 to a closed position to prevent additional air passing to the expansion chamber 50 from the intermediate chamber 39. As the plunger rod 54 completes its impact stroke the piston 48 will have moved toward the front wall 49 past the vent ports 57 allowing the air in the expansion chamber 50 to escape through said vent ports 57 to the atmosphere. The vent ports 58 vent the forward chamber 56 after the piston 48 has closed the vent ports 57 to the chamber 56 and additionally admit air to the chamber 56 during the return stroke of the piston 48 and until the vent ports 57 are again in communication

6

with the chamber 56. This left to right movement of the piston 48 also loads the spring 55, so that when the air pressure is released from the expanded chamber 50 through the vent ports 57, the loaded spring 55 will forcibly return the parts 48 and 54 from right to left back to their positions of Figures 2 and 3. In the meantime, air pressure will have been building up in the intermediate chamber 39 so that when the stem 51 strikes the valve stem 44 to displace the valve 45 from right to left to an open position, the compressed air will rush through the bore 40 and passages 42 into the chamber 50 to cause the piston 48 and piston rod 54 to repeat the operation just previously described, and this operation will continue to be repeated so long as the valve 30 is manually maintained in an open position by gripping action on the handle 37. Likewise, after the tool supporting rod 65 has been projected by impact of the plunger rod 54 with the inner end thereof and said plunger rod has commenced its backward movement from right to left with the plunger 48, the contractile spring 68 will return the supporting rod 65 to its position of Figure 2 before the plunger rod 54 has again been projected outwardly of the front wall 49.

It will thus be apparent that a tool of extremely simple construction has been provided capable of being operated by compressed air and wherein repeated impact or power strokes may be accomplished in rapid succession by a mere gripping action of the operator on the tool. It will also be apparent that the fastening 67 and slot 66 cooperate to prevent the rod 65 turning in the sleeve 59 to thus maintain the impact head, tool blade or bit nonrotatable relatively to the barrel 13 and in a proper position for the work to be performed thereby.

Various modifications and changes are contemplated and may obviously be resorted to, without departing from the spirit or scope of the invention as hereinafter defined by the appended claims.

I claim as my invention:

1. A pneumatic tool of the character described comprising an elongated hollow handle having a forward end and a rear end, a partition disposed in the hollow handle and spaced from the forward end thereof, a piston reciprocally mounted in the hollow handle between said partition and its forward end, a piston rod extending from said piston through the forward end of the handle, spring means urging the piston toward said partition, a normally closed valve mounted in said partition and closing a passage therethrough opening into an expansion chamber defined by the space between the piston and partition, a portion of said hollow handle between said partition and its rear end being adapted to be supplied with air under pressure through said rear end of the handle, means carried by said piston for engaging and displacing the valve to an open position as the piston approaches said partition for admitting air under pressure to the expansion chamber for displacing the piston and piston rod toward the forward end of the handle, said handle having vent ports therein opening to the atmosphere and located between said forward end and said partition and past which the piston travels in its forward movement whereby said expansion chamber is vented to the atmosphere as the piston approaches the forward end of the handle and the spring means thereof is loaded so that said spring means will propel the piston and pis-

ton rod rearwardly toward said partition, said valve resuming a closed position as the piston is moved away from said partition and being re-opened as the piston returns to a position adjacent the partition, and an impact receiving means supported by the handle including a tool head reciprocally supported beyond the forward end of the handle, and a part supporting the tool head and reciprocally mounted relatively to the handle and disposed to be engaged and forcibly projected by the piston rod on the forward stroke of the piston.

2. A pneumatic tool as in claim 1, a second partition member disposed in the handle between its rear end and said first mentioned partition and combining therewith to form an intermediate air chamber between said partitions and a rear air chamber between the second partition and the rear end of the handle and to which rear air chamber air under pressure is initially admitted, said second partition having a manually actuated normally closed valve controlling a passage thereof for admitting air to said intermediate air chamber when said manually actuated valve is displaced to an open position to effect operation of the impact tool.

3. A pneumatic impact tool is in claim 2, a front wall member adjustably mounted in the handle and forming the forward end thereof having a bore extending therethrough and forming a guide for reciprocally receiving the piston rod, said front wall having an external boss surrounding a portion of the piston rod and on which a stationary part of the impact receiving means is detachably mounted, said stationary part of the impact receiving means including a guide sleeve disposed in alignment with said front wall bore and into which the piston rod is forcibly projected, and said first mentioned part of the impact receiving means comprising a rod reciprocally disposed in said guide sleeve and extending outwardly therefrom and having an inner end disposed to be struck by the piston rod as the piston rod is moved to a projected position.

4. A pneumatic impact tool as in claim 3, said front wall member and said first mentioned partition being longitudinally adjustable in the handle for varying the stroke of the piston.

5. A pneumatic impact tool of the character described comprising an elongated hollow handle having a forward end and a rear end, spaced partitions mounted in said handle and dividing the handle into longitudinally spaced chambers, said partitions including a front partition and a rear partition each having passages extending there-through, normally closed valves mounted in said

partitions for normally closing the passages thereof, a piston reciprocally disposed in the handle between its forward end and said front partition, spring means urging the piston toward the front partition and into engagement with the valve thereof for displacing said front partition valve to an open position, a piston rod extending from the piston through the forward end of said handle, impact receiving means supported on the forward end of the handle including a reciprocally mounted tool carrying element having an inner end disposed to be forcibly engaged by the piston rod when projected by movement of the piston forwardly of the handle, said front partition valve assuming a closed position as the piston moves away from the front partition, means for venting the chamber between the front partition and piston as the piston approaches a fully projected position, and manually actuated means for opening the valve of the rear partition for admitting air under pressure to the chamber between said partitions.

6. A pneumatic impact tool as in claim 5, and spring means for displacing said tool carrying element of the impact receiving means to a retracted position to be forcibly struck by said piston rod when the piston is projected.

7. A pneumatic impact tool as in claim 5, said handle being formed of end sections, said front partition forming a coupling member for detachably coupling adjacent inner ends of said handle sections.

8. A pneumatic impact tool as in claim 5, the valve of said rear partition being displaceable to an open position by a rocking movement, an actuating rod connected to a stem of said rear partition valve and extending radially from the handle, and a handle member disposed externally of the handle and engaging said actuating rod whereby a gripping action on the tool handle and actuating handle will rock the rear partition valve to an open position, said handle member and actuating rod forming said manually actuated means.

CLIFFORD E. WHITE.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
134,083	McKay	Dec. 17, 1872
962,688	Aalborg	June 28, 1910
1,046,775	Gross	Dec. 10, 1912

FOREIGN PATENTS

Number	Country	Date
220,096	Switzerland	June 16, 1942